RETRACTED ARTICLE: Meat myofibril: Chemical composition, sources and its potential for cardiac layers and strong skeleton muscle

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ABSTRACT
Meat is the richest source of protein and according to meat sources, the protein is composed of different types of amino acids which are completely dependent upon the protein types. Myofibril is basically muscle protein that's widely present in different types of fish and low quantity is present in different meat (camel). Myofibril is made up of thick and thin myofilaments chemically. Actin, troponymosin, troponin, and tropomyosin are thin myofilaments on the other hand myosin is only the thick myofilament. It is helpful in the formation of strong skeleton muscle and can also strengthen and form the cardiac layers (epicardium, myocardium and endocardium). Technologically, it can be used in the formation of different food products for the purpose of developing diet supplements. This review discussed different sources and chemical properties of myofibril protein and also its potential role toward the cardiac health. Myofibril's thick and thin filaments contribute in the construction of skeletal muscle and enhance the heart's protective coverings. The literature has been collected from Science Direct, Google Scholar and Web of Science. Myofibrils are made up of thick and thin filaments that can help in different human body functions. In the future, more research is necessary that discuss the close relation between myofibril protein and cardiac layers.

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Introduction
Myofibrils protein is an essential macronutrient for building muscle mass, [1] It is obtained from animal sources including fish and camel, [2] Myofibrils help to fuel muscle mass and also aids in metabolism. A protein is formed by the linkage of multiple amino acids by peptide bonds and forms a very long chain. [3] Amino acids act as blocks for the building of protein. The primary structure of the protein is formed by the linear linkage of amino acids. Amino acids combine with each other first to form a polypeptide, then they ultimately form a protein. [4] Therefore, these are essential components of our body and are necessary for many functions, such as synthesis, repair of tissues, and absorption of nutrients. A good protein source for the human body is meat protein. [5] The nutritional value of beef protein is determined by its digestibility. However, the structure and digestion of animal protein may be influenced by Cantonese sausage processes (salting, drying, and sugar addition). Oxidation and aggregation of meat proteins have an influence on their deterioration by

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enzymes of the digestive tract. Protein plays many important roles in our body. It helps in building and repairing our body tissues and it allows many reactions to take place, such as metabolic reactions, and it also helps in coordinating body functions. Providing our body with a structural framework also helps in maintaining normal pH and fluid balance. Animal skeletal muscles have myofibril segments. Myofibrils are composed of two types of fibers: fine and coarse. Slim or mild fibers are formed by curling together strands of the protein actin and an administrative protein, while thick fibers are formed by curling together strands of the protein myosin. The slender and thick fibers structure part of the way, covering layers that are spread out in useful units called sarcomeres. As a result of the examination in which the myofilaments are observed, the myofibril seems to have dim and light groups, giving the muscles a striated appearance. The dim groups are known as a group and comprise of thick fibers and some flimsy fibers. The focal point of the A band is the H-zone, where thick fibers are available, and the M-line, which contains compounds associated with energy digestion. The light groups, known as I groups, are the districts containing slim fibers and are found between the A groups. The I groups are focused on an area known as the Z line, a circle comprised of the protein α-actinin that secures the dainty actin fibers and sets a limit between sarcomere subunits. Sarcomeres form myofibrils that are functional units of muscles. Through sliding filament model, myofibril performs muscles contraction. Incomplete overlap between the thick and thin filaments occurs when muscles are at rest. When thick and thin filaments slide over each another and a great overlap between filaments takes place, shortening of I band and H-zone, these all result in muscle contraction. When muscles contract, the length of sarcomere decreases. While there is no change in lengths of the myofilaments.

**Source of myofibrils**

Animals and plants are the origins of biopolymers that are fundamental proteins. These are required for body development and improvement and are usually known as large sources of nutrients. Regular sequences of proteins that are mixed with dynamic peptides are the main bioactivities of proteins. There are different sources of myofibril shown in Figure 1.

![Figure 1. Sources of myofibril different meat sources of myofibrils and different types of myofibrils.](image-url)
Commonly, muscles of animals, heads, skin, blades, tails, casings, gut and grains are the great sources of proteins.\textsuperscript{[11–14]} The majority of typical protein sources for human consumption come from fish and marine products. Fish protein hydrolyzates (FPHs) are derived primarily from three sources: skin, tissue, and squanders (i.e., fin outlines and heads etc.).\textsuperscript{[15]} The best sources of protein are fish, but the convergence of protein in the range of 8.2 and 23.9% (8.2–23.9 g/100 g) is distinctive as indicated by species. The high amount of protein is found in Thunnus albacares (23.9%), while a minimal amount of protein (8.2%) is present in Harpadon nehereus. Some fishes also have greater than 20% protein like, the best examples are the Mugil cephalus, Euthynnus affinis, Etroplus suratensis, Stolephorus waitei, Tenualosa ilisha, and Lates calcarifer. In the creation of hydroponics, handling protein around (15–16%), the Indian Significant Carps (IMCs) Catla, Cirrhinus mrigala, and Labeo rohita have an vital influence.\textsuperscript{[16]} The minor local fishes that are for the most part disregarded in hydroponics, like Anabas testudineus, have nearly the greatest amount of protein than the IMCs (19%), but a generally lesser amount of protein is present in Heteropneustes freshwater catfishes like fossils and Clarius batrachus. The Tiger prawn (Penaeus monodon 19.4%) has a greater amount of protein than the Indian prawn, Fenneropenaeus indicus (16.4%). 12.9% of Ailia coila and 8.2% of Harpadon nehereus among all fishes have a lesser protein focus. In various fish species, the fixation, quality and kind of protein vary just as in various organs. It is accepted that the meat in fish contains dull and white proteins, creating a terrible taste that prompts modest market items which lack flavor due to minor oxidation.\textsuperscript{[17,18]} In fish, various muscles contain different sorts of protein constitution. Cardiovascular, smooth, and striated muscles are three types of muscles. One of the significant striated muscles present in fishes is associated with connective tissues, ordered into muscle fibers.\textsuperscript{[19]} Furthermore, there are three kinds of fish muscle proteins, like sarcoplasmic proteins, underlying proteins, and solubilization. Actomyosin, tropomyosin, actin and myosin are the primary proteins that contribute (70–80%) to the complete protein substance and that are soluble in a characteristic salt arrangement with the greatest ionic capacity of 0.5 M. Globulin, chemicals, and myoalbumin are incorporated by sarcoplasmic proteins involving 25–30% of the complete protein, and the solvent in the ionic resource of the low capacity salt arrangement is 0.15 M.\textsuperscript{[20]} Gigantic constituents (oxidoreductases, phosphofructokinase PFK, transglutaminase, myoglobin, hydrolases, transferases, and phosphorylase) are the catalysts that cover a large portion of sarcoplasmic proteins, which can’t be totally broken up.\textsuperscript{[21]} Compared with land creatures, in fish muscles and lower vertebrates, proteins are distinctive. Every protein has a level that differentiates expressively between sorts, like no hemoglobin in certain mollusks. The first is cysteine holding. It lacks warm-blooded animals’ myoglobin. Stroma protein contains practically 3% elastin & collagen, which are insoluble proteins. Stroma (Muscle protein) states 10% (w/w) of entire proteins in some fish species, like beam, skate, and shark.\textsuperscript{[22,23]} Increased consumption of fish and fish products has been shown to reduce the risk of acquiring chronic illnesses such as cardiovascular disease, type 2 diabetes, and cancer, all of which result in death. The unique bioactive chemicals found in fish provide insight into the health advantages associated with fish consumption.\textsuperscript{[24]} Intake of fish protein have been demonstrated to diminish stiffness of arterial walls, lowering the prevalence of coronary heart disorders among those that eat many amounts of fish and their derivatives. So the advantage of fish intake is due to Omega-3 polyunsaturated fatty acids (PUFAs) level, namely; because of the existence of the eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) which may lower blood pressure and viscosity.\textsuperscript{[25,26]} Fish protein also protects against heart disease by reducing serum triglyceride levels, increasing cardiac function, lowering blood pressure, and decreasing inflammation.\textsuperscript{[27]} Fish proteins have a high concentration of taurine, and animal experiments indicate that taurine may mediate some of the therapeutic benefits shown so far, but the mechanisms by which fish peptides function are not yet fully understood.\textsuperscript{[28]} Meta-analyses of observational data have shown a beneficial link between fish consumption and a lowered risk of stroke and coronary heart disease.\textsuperscript{[29]}
Composition of myofibrils

Chemically, the myofibril proteins are present in meat, which is attained as “the edible component originating from live animals,” especially “fish and camel.”[14] There are three kinds of meat proteins which can be stated as sarcoplasmic proteins, connective tissue proteins (collagen and elastin) and myofibrils (additionally known as muscle fibrils, made up of long proteins including actin, myosin, tropomyosin, and troponin). Since long ago, seafood like fish, shellfish, and mollusca have been a significant source of excellent proteins that contain adequate measures of fundamental amino acids needed for human regimen.[17] Fish proteins are exceptionally edible and digestible in the gastrointestinal tract. Like other meat proteins, fish proteins are named as myofibrils, sarcoplasmic proteins, and connective tissue proteins (such as gelatin, and so on).[30,31,32]

Myofibrils are made up of bulky myosin protein fibers and fine actin protein fibers. Tropomyosin and troponin-T, C, and I are part of a complex of regulatory proteins linked to actin. In loosening up, for myosin detachment from actin, calcium division from Tn-C and dynamic separation of calcium by the sarcoplasmic reticulum hydrolysis of ATP are required. During the change of any method, the myofilament proteins drew in by these methods, or the ATPase that catalyzes them can change diastolic capacity. In the mild state, without calcium, myosin can’t bind to actin because the restricting site is included by troponin-I. During pressure, when calcium and ATP become open, calcium is bound to Tn-C, a conformational change in this protein complex occurs, Tn-I isolates from actin, tropomyosin shifts toward the focal point of the actin fiber, and myosin can bind to actin. Myosin ATPase catalyzes ATP hydrolysis, causing a conformational change in the actin-myosin cross-framework and withdrawal. During loosening up, extra ATP hydrolysis is required for myosin partition from actin, calcium detachment from Tn-C, and dynamic sequestration of calcium by the sarcoplasmic reticulum. Change of any of these methods or the proteins included can change diastolic capacity. At that moment, contraction of sarcomeres results in fixation between the thick myofilaments due to the small myofilaments sliding. It drags the Z plates into assembled form.[12] Table 1 shows the subclasses and structures of thick and thin myofilaments.

Thick myofilaments

Thick myofilaments are made up of molecules of protein which are nearly 300 curly ordered known as myosin. Every particle of myosin is made up of two weighty chains and four light chains. The heavy chain structures have fibrous, unbending “looped curls” that are called the tail, while the neck areas are afterward divided into globular heads, on which the light chains are connected. Pivots on one or the flip side of the neck permit the myosin heads to distend from the thick myofilaments and turn unreservedly during cross-connect cycling with the slender myofilaments.[38] Although “myosin” is well-known as a component of muscular fibrils, most myosin cousins have functions unrelated to muscle withdrawal. The organic elements of a moderately new group of these unusual myosins, myosins 18A and 18B, are inadequately perceived.[39] It explains another isoform (Myo18A) that is fundamental for heart capacity and suitability in mice. Their discoveries both help and negate other work in the field and bring up new issues about the functions of myosin 18 proteins in vivo. The name “myosin” (from the Greek mys, myos, meaning muscle) comes from the way that half of the skeletal bulk is made out of the proteins presently assigned as myosin II relatives. These proteins gather into bipolar filaments organized into rehashing exhibits that slide comparative with actin fibers during muscle constriction, an interaction pushed by myosin’s F-actin–enacted ATP. Despite the fact that myosin was initially thought to be novel in muscle cells, more modest actions with F-actin–enacted ATPase exercises were then identified in Acanthamoeba, and the field of unpredictable myosins in non-muscle cells was conceived.[38]
Myosin

In fish muscle myosin is the significant protein and decides the nature of the muscle. Fish myosin is ordinarily unreliable, particularly fish myosin in cold-water species. Appropriately, a comprehension of species-explicit denaturation of myosin is significant for assessing the nature of fish muscle. The myosin atom comprises a head and tail segment and accordingly the denaturation of these two areas was broke down upon the warming and freezing of myofibrils (Mf). Additionally, special actin denaturation decides myosin denaturation in Mf upon treatment with high groupings of salt or by freezing. The files for identifying myosin and actin denaturation in Mf were effectively applied to assess the nature of Bluefin fish tests and frozen surimi.

Myosins are a group of protein engines that impact numerous sorts of motility in eukaryotic, from organelles to single cells and all organisms. Maybe the best-examined myosins are Class II (regular) myosins, which incorporate nonmuscle just as smooth muscle and sarcomeric muscle myosins. The contractile and bioenergetics prerequisites of sarcomeric muscles (vertebrate skeletal and cardiovascular) change among living beings just as spatiotemporally inside creatures. These variable requests are met by utilizing distinctive myosin proteins.

During postmortem preservation, as a result of proteolytic chemicals working on both muscle cells and connective tissue fish muscle, which degrades rapidly. In handled meats, salt-and phosphate-extracted myofibrillar proteins, which are prevalent gelling, fat-emulsifying, and water-restricting specialists, are to a great extent liable for the item textural properties. A solitary most significant
utilitarian protein is myosin. Aside from them in situ usefulness, muscle proteins, including fish surimi, collagen, plasma protein, and other meat result proteins, are arranged and used as functional food ingredients.\[43\]

**Thin myofilaments**

Thin myofilaments are a polymer of actin with firmly bound executive proteins troponin and tropomyosin. At the point when the cytoplasmic Ca\(^{2+}\) focus is low, troponin and tropomyosin repress the actin-enacted adenosine triphosphatase (ATPase) of myosin.\[46\] Tropomyosin, a 40-nm long snaked curl of two \(\alpha\)-helical polypeptides ties horizontally to seven bordering actin subunits just as head to tail to adjoining tropomyosins, framing a nonstop strand along with the entire slender fiber. Tropinin (TN) comprises three distinct subunits called TNC, TNI, and TNT.\[47\] Dynamite secures one tropinin complex for each tropomyosin snaked curl. TNC is a free-weight molded protein with four EF-hand themes to tie divalent cations like calmodulin. In resting muscles, the C-terminal globular area of TNC ties two Mg\(^{2+}\) particles and \(\alpha\)-helix of TNI, while the low-partiality locales in the N-terminal globular space of TNC are vacant. The Ca\(^{2+}\) restricting to the low-partiality locales (two in quick skeletal muscle; one in sluggish muscle) during muscle enactment limiting site for TNI. The subsequent conformational change in TNI permits tropomyosin to move away from the myosin-restricting locales on the actin fiber.\[48\]

The contractile protein actin is mostly used to construct thin filaments. Actin is composed of small spherical subunits (G actin) that form lengthy strands referred to as sinewy actin (F actin). When two strands of F actin curl on each other to make a shape of twofold helical construction, a fiber of actin is framed; it takes after two pearl strands twisted around each other and might be alluded to as a twisted loop.\[49\]

**Actin**

Thin myofilaments contain a series of globular actin protein atoms that reside gathered in the twofold helical fibers. At every globular actin, particles are locales in which the heads of myosin are tied.\[50\] While in resting muscle, such as myosin restricting objectives are obstructed by the protein atoms of tropomyosin, which are comparative in design to the tail of myosin. The center of skeletal muscle Z-circles is comprised of actin fibers from contiguous sarcomeres that are cross-connected by \(\alpha\)-actinin homodimers. The PDZ theme containing protein (ZASP)/Cipher connects with \(\alpha\)-actinin, myotilin, and other Z-circle proteins by means of the PDZ space. Notwithstanding, these associations are not adequate to keep up the Z-circle structure. ZASP is straight forwardly associated with skeletal actin fibers.\[51\]

The actin-restraining space is between the secluded PDZ and LIM areas. This ZASP locale joined again, so each isoform has one of these kinds of actin-restraining areas. All ZASP isoforms contain the exon 6-encoded ZASP-like theme that is transformed into zaspopathy, a myofibrillar myopathy (MFM), though the exon 8–11 intersection encoded peptide is selective for the post-pregnancy long ZASP isoform (ZASP-Lex10). MFM is described by disturbance of skeletal muscle Z-circles and amassing of myofibrillar corruption items. Wild-type and freak ZASP communicate with \(\alpha\)-actin, \(\alpha\)-actinin, and myotilin. Articulation of freak, however not wild-type, ZASP prompts Z-plate disturbance and F-actin amassing in mouse skeletal muscle, as in MFM. Changes in the ZASP-Lex10 actin-restricting region, but not in other isoforms, disrupt the actin cytoskeleton in muscle cells. These isoform-explicit change impacts feature the fundamental part of the ZASP-Lex10 isoform in F-actin association. Our results show that MFM-related ZASP transformations in the actin-restraining space affect the center construction of the Z-plates in skeletal muscle.\[52\]
**Tropomyosin**

Tropomyosin’s chemo immunological properties in Atlantic salmon (Salmo salar) and flathead dim mullet (Mugil cephalus) came about because assimilation of pepsin is broken down.\(^{[53]}\) Against fish protein monoclonal and polyclonal antibodies to distinguish the allergens from salmon and mullet, their IgE- and IgG-restricting proteins/peptides are examined utilizing fish-hypersensitive human sera. In totally tried human sera as an outcome, the significant allergen in fish, parvalbumin from the two species is perceived. Tropomyosin-bound IgE was detected in about 71% of analyzed human sera. The antigenic determinant of perfect tropomyosin was reduced to a fraction of the time required for pepsin processing. The amino corrosive sequence of mullet tropomyosin was degraded using a pair of mass spectrometers. On Atlantic salmon tropomyosin alpha-1, two IgE epitopes were planned. Generally speaking, in both fish species, tropomyosin is recognized as a significant IgE-restricting protein. In any case, more examinations are needed to decide the objective meaning of fish tropomyosin as an allergen because, like human tropomyosin, it has high homogeneousness.\(^{[54]}\)

**Troponin**

Troponin is a protein found in the heart and skeletal muscles. When the heart is effected, it excretes troponin into the circulatory system. Specialists measure your troponin levels to distinguish whether you’re experiencing a coronary episode. This test can likewise help specialists track down the best treatment sooner. Previously, specialists utilized other blood tests to identify the coronary failure. This wasn’t successful, but it could be in light of the fact that the tests weren’t adequate to recognize each assault. They also elaborated on substances that weren’t adequately explicit on the heart muscle.\(^{[55]}\)

**Tropomyosin–troponin complex**

Along the thin myofilaments, at a 40-nm gap, tropomyosin molecules are joined to troponin buildings. There are three proteins in the troponin building (troponin C, troponin I and troponin T). Calcium is bind by troponin C while on the thin myofilament Troponin I secures the intricate. Troponin T has a role in connecting tropomyosin particles. Tropomyosin is bound by the protein complex troponin. While on actin molecules, binding sites of myosin are inhibited by Tropomyosin.\(^{[56]}\)

**Functions of myofibrils in the body**

Because fishes are recognized as the most plentiful protein sources, they play an important role in the human environment in terms of nutritional, low-cost, conservative, social, and sports benefits. In non-industrial nations, more than 60 million individuals depend on fish and their results for their income as well as health necessities. The need for fishing items is expanding because of the increase in the population of the whole world. For better preservation conditions, this increment has become more noticeable in the expanding trade of fish items. The most significant dietary ingredients found in freshwater dwelling inland fish are proteins, basic fats, oils, and micronutrients. They have the ability to improve the health of humans and to overcome starvation and hunger in the world.\(^{[57,58]}\)

Fish protein is famous for improving the edible food that contain basic amino acids such as tryptophan, cysteine, lysine, methionine, and threonine.\(^{[59]}\) Regardless, the existence of basic amino acids and peptides like lysine and methionine is much higher in amphibian and water-proficient proteins than in earthly meat proteins. The World Health Organization (WHO), after contrasting it with the standard protein, suggested the constitution and ingestibility of protein go from 77 to 98.7%. When applied to various conditions, the significance of fish proteins is considered for maintenance of health and its related problems, such as maintaining food ingredients. The addition and application
Table 2. Functions of myofibrils in the body.

| Functions                                                                 | References |
|---------------------------------------------------------------------------|------------|
| Myofibril is responsible for cardiac contractile and relaxation parameters | [65]       |
| The thin filament troponin–tropomyosin regulatory complex inhibits contraction in resting muscle by occluding myosin binding sites on actin | [66]       |
| Thick filaments of myofibril may aid in the regulation of skeleton and cardiac muscle contraction | [67]       |
| Troponin (thin filaments) is the sarcomeric Ca2+ regulator for striated (skeletal and cardiac) muscle contraction | [68]       |
| Myofibrils are the basic functional unit of skeletal muscle and are contained syncytia multinucleated cells that vary considerably in their biochemical and physiological properties | [69]       |
| Myosin is thick myofilaments that are the prototype of a molecular motor. It is a protein that converts chemical energy in the form of ATP to mechanical energy, thus generating force and movement | [70]       |

of protein into the feed, remedial, and pharmaceutics industries wherever in the world, the fish developing industry plays a huge part.\(^{[58]}\) Regardless, it has become one of the most protein-conveying organizations for all customers. Fish provides roughly 20% of agricultural nations’ protein requirements, but this demand is substantially higher in emerging countries. Fish is well-known as a fiery meal that plays an important role in human nutrition. Besides, nearly 60% of the portions of fish, such as skin, heads, traces, edges, adornments, roes, and viscera, which are evaluated as waste, contain an alluring proportion of protein. Fish protein portions eaten by individuals are simply 40%. The waste fish protein portions also contain an attractive measure of protein.\(^{[60]}\)

Fish handling process, for the creation of some notable protein hydrolyzates (PHs) for example, fish head PHs, fish skin PHs, instinctive fish PHs, fishbone PHs, fish roe or egg PHs, and fish liver PHs are produced by utilizing these parts.\(^{[61,62]}\) Fishes are widely utilized for the creation of different sorts of proteins because of their remarkable biological activity. For example, they act as anticancer, cancer prevention, agents against free radicals, and antihypertension. Additionally, these are energetically prescribed to improve insulin affectability, ready to bring down cardiovascular and metabolic disorder changes, type 2 diabetes and to recover the strength of skeletal muscles.\(^{[63,64]}\) Fish proteins, on the other hand, offer a variety of remarkable utilitarian features, such as emulsification, foaming, water-holding limit, adjustability and dissolvability, fat-restricting limit, and the ability to gel, all of which result in extra intriguing hydrocolloids. The intriguing research area of fish proteins in various food sources has persuaded us that fish proteins could be utilized as functional food sources. Different functions of myofibrils are listed in Table 2.

**Potential therapeutic prospects of myofibrils**

Since its inception, myofibril mechanical evaluation has resulted in significant advancements in our knowledge of muscle function. When compared to investigations using bigger preparations, myofibril-based mechanical tests provide a number of distinct benefits. For starters, because myofibril mechanical experiments involve the smallest possible ensemble of muscle motor proteins, they allow for the evaluation of muscle mechanics that is not influenced by non-motor protein systems such as those involved in calcium handling, energy metabolism, and the extracellular matrix. Second, skinned cardiac fiber or intact cardiomyocyte preparations do not allow for the amount of detail that myofibril mechanical tests may give, such as the resolution of the two stages of cardiac muscle fiber relaxation.\(^{[71]}\) Being therapeutic bioactive compounds, fish proteins perform organic activities. Native proteins include a few bioactive peptides that prevent from irritation, hostile to diabetics, and anti-hypertension activities.\(^{[72]}\) In the new period, food businesses and analysts are worried about what may create unwanted off-flavor and poisonous oxidation of lipids.\(^{[73,74]}\) Numerous manufactured oxidative prevention agents consisting of Propyl Gallate, Hydroxyanisole, tert-Butylhydroquinone, and Butylated Hydroxytoluene are being utilized, yet they are not invited into serious guidelines.\(^{[75]}\) Potential role of myofibrils in imparting strong skeletal muscle and cardiac layers are listed in Table 3.
Myofibrils potentially strengthen the heart muscle

The heart is a muscle-bound organ in most animals. Through the blood vessels (arteries, capillary, and veins) of the circulatory system, the heart pumps blood. This blood transports oxygen and nutrients to the body, also conveying metabolic waste like carbon dioxide toward the lungs. The major function of heart is to keep blood oxygen-enriched and circulating all over the body.\cite{82} The epicardium is the outer layer of the heart wall (obviate extra extension or heart movement),\cite{83} the middle layer is the myocardium (instigate shrinkage driving the cardiac cycle),\cite{84} while the endocardium is the inner layer (involved in the lining cavities and valves)\cite{85} (Figure 2).

The muscle filaments of the heart are made up of myofibrils that comprise the tightening segments of lined muscles. To perform work and create energy, myofibrils are responsible for the transformation of synthetic energy into mechanical energy. Myofibrils are characterized by a homogeneous progression of cross-over stripes, containing replicated singular units called sarcomeres.\cite{86} Cardiovascular muscles, such as skeletal muscles, seem striated because of the coordination of muscle tissue into sarcomeres. Cardiovascular muscles are distinctive in a few ways, including skeletal muscles. Cardiovascular muscles are made up of cylindrical cardiomyocytes known as heart muscle cells.\cite{87}

The cardiomyocytes are made up of rounded myofibrils, which are replicating segments of sarcomeres. The sarcomeres can be divided into two primary segments depending on their particular qualities: 1) the contractile proteins (that control muscle withdrawal and unwinding)

\begin{table}[h]
\centering
\caption{Role of myofibrils in imparting strong skeletal muscle and cardiac layers.}
\begin{tabular}{|l|l|l|l|l|}
\hline
Meat source & Myofibril types & In Vivo/In vitro & Improvement/result & Authors \\
\hline
Zebrafish & Myofibril & – & Aid in the development of skeletal and cardiac muscle & \cite{76} \\
& Myosin & In vivo & It is suggested that heart failure affects both the quantity and isoform distribution of skeletal muscle MHC protein & \cite{77} \\
Fish & – & In vivo & Fish protein hydrolyzate may have a role as a cardioprotective nutrient & \cite{78} \\
& Myosin & – & In adult skeletal muscle, myosin is a major consumer of ATP & \cite{79} \\
Embryonic stem cell & Sarcomeric & – & ATP-driven myosin forces can power the movement of the skeleton & \cite{80} \\
\hline
\end{tabular}
\end{table}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{heart_layers.png}
\caption{Different protective layers of heart.}
\end{figure}
and 2) the cytoskeletal proteins (that provide mechanical support and enable cells to conduct crucial functions such as movement and division). Myofilament compression is controlled by the slight actin and thick myosin fiber proteins that associate to produce energy. Power creation and muscle shortening result from the entire amount of all "enacted" strains producing cross-stretch. The guideline of this connection is subject to the measure of obtainable Ca2+ and ATP just like the slender fiber administrative troponin–tropomyosin complex that ties to actin and manages cross-connect cooperation. The cytoskeleton frames the framework of cardiomyocytes as it controls cell shape, gives mechanical accuracy and resistance, and settles the sarcomeric proteins.

**Myofibril potential in skeleton muscle**

Generally low quantity of muscle mass of bulk has been seen in 20% to 70% of individuals. “Sarcopenia” is a deficiency of low muscle mass. It is normally connected to maturing. Muscle related to constant infections, including malignancy, is frequently alluded to as’ “auxiliary sarcopenia.” Other than optional sarcopenia, skeletal muscle shortcoming is much of the time noticed in unstable patients with the cutting-edge disease and during or after the enemy of malignant growth treatment. These components increase basal metabolic rate, restrain adipocyte and skeletal myocyte separation, and decrease food consumption. Moreover, chemo treatment and radiotherapy can additionally decrease food intake and modify digestion by causing sickness, retching, weariness, and dyspepsia, further adding to weight loss and muscle squandering. Changes in the entire body pace of patients with cutting edge malignancy, the appearance of amino acids has been reported. Furthermore, unusual corrosive profiles with plasma-free amino vary among disease stages, tumor types and levels of weight reduction have been accounted. Studies examine muscle digestion in patients with disease discovered conflicting outcomes as protein in skeletal muscle partial amalgamation rate was discovered to be unaltered or decreased in malignancy patients. A new report looking at muscle myofibrillar protein combination discovered tantamount qualities between sound members and weight-losing patients with gastrointestinal malignant growth, proposing that muscle squandering can be more identified with the expanded breakdown in muscle protein. In patients with non-little cell cellular breakdown in the lungs, the decrease in muscle strength is additionally present.

Patients having disease didn’t encounter a significant degree of anorexia, as they had the option to keep up adequate dietary protein and calorie consumption. As recognized a few metabolic irritations, hypothesized that a large number of patients were pre-cachectic, portrayed by upset digestion that didn’t yet remind any measurable muscle misfortune, but with critical muscle shortcoming. This recommends that treatment in the pre-cachexia stage expected to decrease muscle shortcoming should be started targeting normalizing the noticed metabolic unsettling influences. The breakdown of myofibrillar protein and waste of muscle relate to metabolic inspection in small gatherings of disease patients, and hence, we believe that our examination gives valuable data about the digestion of protein by chemotherapy in patients. In conclusion, this investigation shows that pre-cachectic patients with advanced malignancy going through chemotherapy having diminished strength of muscle and unaltered bulk and typical announced physical action have effectively expanded amino corrosive turnover and breakdown of myofibrillar protein that identifies with their decreased strength of the muscle.

**Food applications of myofibril rich meats/meat products**

Health assistance, care, and treatment beyond the key bioactive ingredients that are provided by the food sources of functional foods. For the improvement of body capacities, these could be all around characterized as dietary enhancements that can expanded more acknowledgment. The fish protein is utilized as a useful fixing, relying upon its capacity to settle the remaining lipids through explicit handling for the improvement of utilitarian and dietary quality. Fish-inferred yet additionally adversely influences the
tangible score of conclusive yields. Tangible assessment of fish fixings on the food enhancement showed adverse consequences on smell and odor when it isn’t utilized in a permissible amount. Thus, the enhanced amount should not influence the physical properties and acknowledgment of items due to being an excellent source of protein to upgrade and improve the nourishing degree of less nutritious food. In the supplementation of food, fish protein packs are utilized. In cereal items, finer quality protein concentrate is used as a decent lysine source. For example, the low lysine amount in rice is an incredible enhancement. In the development of numerous sorts of bread rolls, fish meat protein in freshwater accumulate and their results are joined. Proteins utilized around 6% in bread roll redness extracted from T. nilotica. For the aroma and appearance, the tangible board acknowledged the item having a fish protein concentrate of 10%. For the development of bread items, minced fish can be utilized. Instead of the surimi application in its genuine structure, dried surimi blended with noodles by Malaysian shoppers is utilized. Addition into the noodles, the surimi gets drained at 60°C to bring down the dampness content by up to 10% prior. The developers recommended that the best amount for noodle formation is the addition of 5% dried surimi. Powdered fish protein is the most extreme strategy that can upgrade the wholesome degree of oat protein. Table 4 show the Industrial applications of myofibril rich meats/meat products

**Conclusion**

This study provided an overview of the myofibril protein, including its chemical makeup, health advantages, and potential therapeutic applications. Myofibril is a kind of protein that may be found in fish and other meats, among other things. According to a prior research, fish myofibril is an essential component for human health. Myofibrils are made up of thick and thin filaments that help in the creation of skeletal muscle and the strengthening of the heart’s protective coverings.

**Disclosure statement**

No potential conflict of interest was reported by the author(s).

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