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**Construction of cDNA Libraries on the Rise in Cutting Edge Sports Gene Research**

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**Professional athletes’ genomes contain DNA that could be of great use to scientists today. In 2015, an article was published where scientists collected DNA from professional and Olympian half-pipe snowboarders. With this DNA, they constructed full-length cDNA libraries and analyzed expressed sequence tags from the snowboarder’s lymphocytes. Once the cDNA library was made, the athletes’ genes were studied and classified based on composition, function, signal paths, and other biological characteristics. While the scientists admit that in order for their research to be truly effective they would need an extensive amount of data from all different kinds of athletes from various ethnic and cultural backgrounds, they do believe that they have demonstrated that the construction of cDNA libraries is a necessary and effective molecular technique for identifying genetic markers of athleticism and for continuing to gain resources in the field of genetic sports.**

**Introduction**

In the world today, professional athletes are known as icons, and outsiders are always looking for supplements to enhance their bodies to the level of performance that professional athletes have from their genetics. Constructing a full-length cDNA library allows for the full evaluation of expressed sequence tags. The relevance of this stems from acknowledging that the only way to fully understand the genetic makeup of professional athletes today is to study their preserved cDNA libraries. The true results of this study will only come with more and more compilation of cDNA libraries from professional athletes genomes, however, it is great current progress in itself that athlete’s genomes’ are finally being studied today. The current status of this field of study is promising with more and more research being conducted on athletes ethnic backgrounds but is still lacking in diversity in sampling and athlete backgrounds.

**Recent Progress**

The “C” in cDNA stands for “complementary”. The word complementary in the context of molecular biology refers to A-T and C-G base pairing between two strands of DNA. A cDNA strand is synthesized from a messenger RNA template called mRNA. The mRNA strand will contain unpaired bases and the cDNA strand will be created in its complementary image. The mRNA is simply used as a template. It is important to note that there are no introns in cDNA. This is because mRNA is used as the template for cDNA synthesis and mRNA does not contain any introns. Before the mRNA strand is made, introns have already been sliced out through the sNRP and spliceosome mechanism. Complementary DNA is usually used to form cDNA libraries, because it allows for a lot of molecular research and testing of various organisms and diseases. This was the perfect molecular tool for studying parts of professional athletes’ genomes because it can show what DNA is expressed. The cDNA library made of gene samples from professional half pipe snowboarders was analyzed and showed many trends that with time and more data could conclude why these individuals have the ability to snowboard so much better than ninety five percent of the world’s population (Genetics and Molecular Research Journal). The study stated that they believe they have found correlation in the genome of these professional athletes but would need other scientists to start creating cDNA libraries of more athletes from different sports and more diverse ethnic backgrounds in order to truly understand their data. Hopefully, studying the sequence tags of professional half pipe snowboarders is just the beginning for this field. If every professional athlete provided a blood sample for this study, the world of professional sports might be totally blown open and drugs could be developed to create mutations in normal people to give them the ability as these professional athletes. Unfortunately, that means that this study could come with a lot of ethical problems and should be continued only in hopes to gain insights on athlete DNA and not to try and mimic their genomes in others. The focus of the future in this field should be to gain as much data as possible through constructing as many full-length cDNA libraries as possible in order to truly understand the makeup of the athletic icons the world has grown to love without threatening their careers by making their genomes readily available to be cloned by scientists in order to give these traits to non-athletic people in the population. With time, the field of genetics will grow and new molecular tools will be invented that could also give insight to this field of study but until then, cDNA libraries seem to be the most ideal way to further this subject.

**Discussion**

Genetics plays a major role in the ability of everyone to perform certain tasks at certain levels of performance. This is especially relevant when it comes to athletes. However, it is important to also note that genetics influence personality traits as well as muscle striation and development. It is common knowledge that professional athletes must demonstrate great discipline and dedication in order to use their natural abilities to their advantage. Scientists are now starting to say that the intense dedication that athletes show to their sport is also a genetic factor and not simply based on the environment or culture that these athletes come from. Furthermore, many scientists have studied how different sports tend to be easier for different ethnic groups. That thought, if proven, would show that genes play a direct and powerful role in whether or not an individual would have a chance of being a professional in their sport of choice. In fact, it is no coincidence that athletes from Kenya hold a third of the top times in distance races (Entine, John). Another statistic that one might be surprised to hear is that no African American has ever won an Olympic medal in weight lifting (Entine, John). It seems as though weight lifting is an Olympic sport that has always have been dominated by Eurasian countries (Entine, John). The main genetic contributors to this data could be the amount of testosterone produced, formation and striation of muscles, and the willpower to practice that was mentioned earlier.

Soon, with lots of government and scientific cooperation, there will be cDNA libraries filled with thousands of different athletes’ genes from hundreds of different sports. However, it will take time to get to that point because constructing a cDNA library involves sample preparation, tittering of the unamplified library, determining the percentage of recombinant clones, library amplification, tittering of the amplified library, determining of the cDNA insert size by PCR, and sequence tag analysis, all of which takes time and can be expensive to preform regularly (Genetics and Molecular Research Journal). In addition to that, usually gel electrophoresis, column chromatography, gene sequencing, and gene mapping is needed to interpret what the cDNA library contains. The good news is that a cDNA library can have many important uses for multiple different areas of study in science. Due to the fact that cDNA libraries do not contain introns, they can be used in prokaryotes and eukaryotes. These libraries are extremely beneficial to biotechnologists and molecular biologists. They are also extremely useful in studying the expression and transcription process of eukaryotic genes, which can be used to study links between eukaryotic and prokaryotic DNA. This is accomplished by eukaryotic genes being taken out of eukaryotic cells, made into cDNA libraries, and then inserted into prokaryotic cells for further study of their function and contribution to disease. In addition to that, they can also be used to isolate DNA sequences in order to code mRNA. Coding mRNA can give access to a lot of other characteristics within an organism’s genome and help isolate homologous genes. However, The most important use of a cDNA library would be its helpfulness in studying the expression of mRNA. Studying mRNA expression is really useful to predict protein expression. Since protein expression controls all normal bodily functions and is most commonly affected by disease, this use of cDNA libraries is very important and versatile.

The article mentioned in this review is just the beginning for this field and there is a lot of hope for the future of studies like this one. The use of cDNA libraries is a great one because of how much it can truly reveal about DNA sequences. Hopefully with time the cDNA libraries will grow with various DNA from various professional athletes.

**References**

Entine, John. May 20th, 2015. Genetic Library project. “Sports Genes: What makes great atheltes and why it matters”

Y.H Zhao, Z.B Zhang, C.Q Zhao, Y. Zhang, Y.F Wang, W.J Guan, and Z.Q Zhu. October 21st, 2015. Genetics and Molecular Research Journal Res. 14. “Constructing a full-length cDNA library and preliminary analysis of expressed sequence tags from lymphocytes of half-pipe

snowboarding athletes”. Pg. 12922-12930.