North African Jewry: The Possibility of Introducing Genetic Screening

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Many of the Jewish communities in North Africa are among the oldest in the world, dating over 2,700 years. Jewish communities in North Africa, including Morocco, Algeria, Libya, Tunisia, Sudan, and Egypt, were established early in the Diaspora; other Jewish communities arrived after their expulsion from Spain in 1492 [1]. Over the twentieth century, the vast majority of these Jews have emigrated, mainly to Israel and France, with substantial numbers moving to South America, Canada and the US, and establishing communities there.

Due to the largely homogenous Jewish communities that were present in North Africa for centuries, similar genetic markers, as well as unique genetic diseases, can be traced to these insular communities. The similar genetic make-up among the North African Jewish communities is indicative of their seclusion and minimal intermarriage, strengthening the claim of a Jewish presence in North Africa since the destruction of the first Beit Hamikdash.

Dr. Harry Ostrer, a medical geneticist at the Albert Einstein College of Medicine and author of papers on North African Jewish genetics, stated, “Jews tend to be more related to one another than they are to non-Jews, including non-Jews living nearby - it’s true in every region” [2].

In a recent study published in Proceedings of the National Academy of Sciences, Dr. Ostrer and colleagues analyzed DNA samples from 509 people of North African Jewish origin [3]. Upon comparing the single nucleotide polymorphism (SNP) data with data from a variety of other Jewish and non-Jewish groups, they found that the North African populations had genetic patterns more similar to European and Middle Eastern Jews than to non-Jewish people from that region. The data indicated that the Jews in this region seldom intermarried with non-Jews. In addition, the North African Jews formed two major subgroups: (a) Moroccan and Algerian Jews and (b) Tunisian, Djerban, and Libyan Jews. These two subgroups exhibited a high degree of marriage within their own community (or, endogamy) and showed significant relatedness to European and Middle Eastern Jews, with both subgroups being part of the larger Ashkenazi and Sephardic Jewish groups. The researchers attributed these later findings to the North Africans Jews marrying with Sephardic Jews who arrived after their expulsion from the Iberian Peninsula in the 15th century.

“This work demonstrates a shared genetic history among the Jews of North Africa and strengthens the case for a biological basis for Jewishness,” said Ostrer [3]. Moreover, with this knowledge in hand, the discrete genetic patterns of North African Jewry have led to the presence of distinct hereditary disorders that characterize these communities. Just as Ashkenazi Jews have unique genetic disorders, such as Tay Sachs disease, in their community, the North African Jewish community also has its own unique genetic disorders that range from common to rare and that vary in their modes of inheritance [4].

A common genetic disorder in the North African Jewish community is familial Mediterranean fever (FMF) (OMIM #249100), an autosomal recessive disorder resulting from mutation in the pyrin gene. This disease is manifested by recurrent attacks of fever and inflammation of liquids around the abdominal cavity, the joints, and the lungs [5]. Amyloidosis and renal failure are clinical complications that may develop. FMF was notably observed in Jews from Libya, Morocco, and Tunisia. FMF is commonly found in men, more so than in women, and is believed to affect one in seven Jews from these regions. The most common clinical treatment for this disorder is colchicines, which can ameliorate some of the painful symptoms. A late-onset form of the disease was characterized by Tamir et al. [6]. These patients experienced their first FMF attack at age 40 or later.

Similarly, glycogen storage disease type III (GSD III) (OMIM #232400) is an autosomal recessive disorder that heavily affects North African Jews. GSD III, caused by deficiency of a glycosgen enzyme, is characterized by an accumulation of abnormal glycogen with short outer chains. Many patients are enzyme-deficient in liver and muscle and experience hepatomegaly, hypoglycemia, and growth retardation. Muscle weakness can become more severe in adults, and some affected people will develop cardiomyopathy [7]. When examining the population genetics of this disorder, the overall incidence of GSD III is about 1 in 100,000 live births in the U.S.; however, it possesses a frequency of 1 in 5,400 with a carrier frequency of 1 in 35 among North African Jewish individuals in Israel [8].

Another disorder common in North African Jews is ataxia-telangiectasia. Mutation of the ATM gene is responsible for this autosomal recessive disorder characterized by cerebellar degeneration, immunodeficiency and cancer predisposition. Carriers of the gene were reported to be moderately cancer-prone. A single mutation was observed in 32/33 defective ATM alleles in Jewish A-T families of North African origin, coming from various regions of Morocco and Tunisia. This mutation occurs as a stop codon, or a nucleotide triplet that signals a termination of DNA replication, at position 35 of the ATM protein. This founder effect presented an opportunity for population-based screening for carriers of ataxia- telangiectasia carriers in the Jewish community [9]. In population genetics, the founder effect originates when a few individuals establish a larger population, causing a loss in genetic variation among a group.

Clearly, unique hereditary genetic disorders are identified within different North African Jewish communities. This resulted from their isolation, endogamous marriages, and restricted gene pool in these Jewish communities over hundreds of years. Little emphasis has been directed to developing a panel of genetic screens for North African Jewry. However, such a screening panel is the
obvious solution to minimize the incidence of disorders associated with this community. Genetic screening has proved successful for other Jewish subgroups, in particular the Ashkenazi Jewish community, and programs, such as Dor Yeshorim, have lessened the incidence of Tay Sachs disease tremendously [10]. Creating a genetic screening system specific to North African Jewry could potentially lower the incidence of their specific genetic disorders, a valuable concept since North African Jewry comprises the third largest group of World Jewry. Although introducing genetic screening into a large Jewish sub-group will be challenging, primarily because of the various modes of inheritance in this Jewish group, the benefits for future generations in reducing incidences of these diseases are tremendous.

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References: