

mtDNA Affinities of the Peoples of North-Central Mexico

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mtDNA haplotypes of representatives of the cosmopolitan peoples of north-central Mexico were studied. Two hundred twenty-three samples from individuals residing in vicinities of two localities in north-central Mexico were analyzed. A combination of strategies was employed to identify the origin of each haplotype, including length variation analysis of the COII and tRNA^{LYS} intergenic region, nucleotide sequence analysis of control region hypervariable segment 1, and RFLP analysis of PCR products spanning diagnostic sites. Analysis of these data revealed that the majority of the mtDNA haplotypes were of Native American origin, belonging to one of four primary Native American haplogroups. Others were of European or African origin, and the frequency of African haplotypes was equivalent to that of haplotypes of European derivation. These results provide diagnostic, discrete character, molecular genetic evidence that, together with results of previous studies of classical genetic systems, is informative with regard to both the magnitude of African admixture and the relative maternal contribution of African, European, and Native American peoples to the genetic heritage of Mexico. Phylogenetic analysis revealed that African sequences formed a basal, paraphyletic group.

Introduction

According to widespread popular belief, the present day peoples of Mexico are, by and large, descendants of Native American and European (Spanish) ancestors. Historical accounts also document African slavery in Mexico during the 16th–18th centuries (Beltrán 1944). Although records from this period are incomplete, estimates of the number of African slaves brought to Mexico are in the range of 200,000–500,000 (Beltrán 1944; Curtin 1969; Muhammad 1995). The actual number may be higher, since many slaves were imported illegally, without documentation, and since African ancestry was often not reported for census data (Beltrán 1944; Tjarks 1978; Muhammad 1995). The contributions of Africans to the genes and culture of the peoples of Mexico have been largely denied and forgotten in popular culture. Consequently, these Africans have been culturally and genetically assimilated to a greater extent than has been the case in other regions of the Americas.

Various classical genetic systems (blood groups, blood enzymes, and blood proteins) have been used to estimate

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haplotypes among the general cosmopolitan population, to provide information regarding both Mexican history and prehistory.

Most Native Americans share common mtDNA mutations that define four primary haplogroups (A, B, C, and D), reflecting descent from Asian colonization of

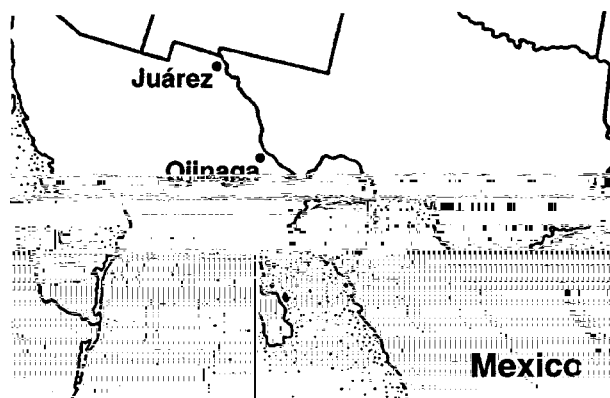


Figure 1 Locations of sample collection: Ciudad Juárez and Ojinaga, Chihuahua, Mexico.

Ten of these samples, identified by the presence of the *Hae*III site at np 663 as haplogroup A, also possessed the 9-bp deletion. Not 1 of these 10 samples had the *Hae*III site at np 16517, which is generally associated with both the deletion and haplogroup B, whereas all haplogroup B samples had the site present. Furthermore, HV1 sequence data were obtained for 7 of these 10 samples and were included in the phylogenetic analysis. The phylogenetic positions of these seven samples were within haplogroup A. These results confirm that the 9-bp deletion has arisen more than once, in two Native American haplogroups. Presence of the deletion in haplogroup A has been reported, in other studies, at low frequencies (Ballinger et al. 1992; Torroni et al. 1993, 1994c).

Of the 87 samples for which HV1 nucleotide sequence data were obtained, 63 had haplogroup A-, B-, or C-specific nucleotides at polymorphic positions, and, on the basis of restriction site analysis, one sample was identified as haplogroup D (table 3). Sixteen samples had Native American haplogroup A-specific nucleotides; Native American haplogroup B-specific nucleotides were present in 32 samples; and haplogroup C-specific nucleotides were present in 14 samples. One haplogroup B sample did not have a C at np 16189, and one haplogroup C sample did not have a C at np 16298; however, these samples were identified as being haplogroup B and haplogroup C, respectively, on the basis of the 9-bp deletion and restriction site analysis. All samples belonging to Native American haplogroups A, B, and C, which we ascertained on the basis of HV1 markers, had corresponding haplogroup restriction site markers. Samples identified as Native American did not have African or European HV1 or restriction site markers.

Non-Native American Haplotypes

Twenty-four samples did not possess Native American mtDNA markers. Twelve of 24 non-Native American samples were identified as European haplotypes (table

Native American Haplogroups and HV1 Sequence Variation Observed for Individuals of North-Central Mexico

(continued)

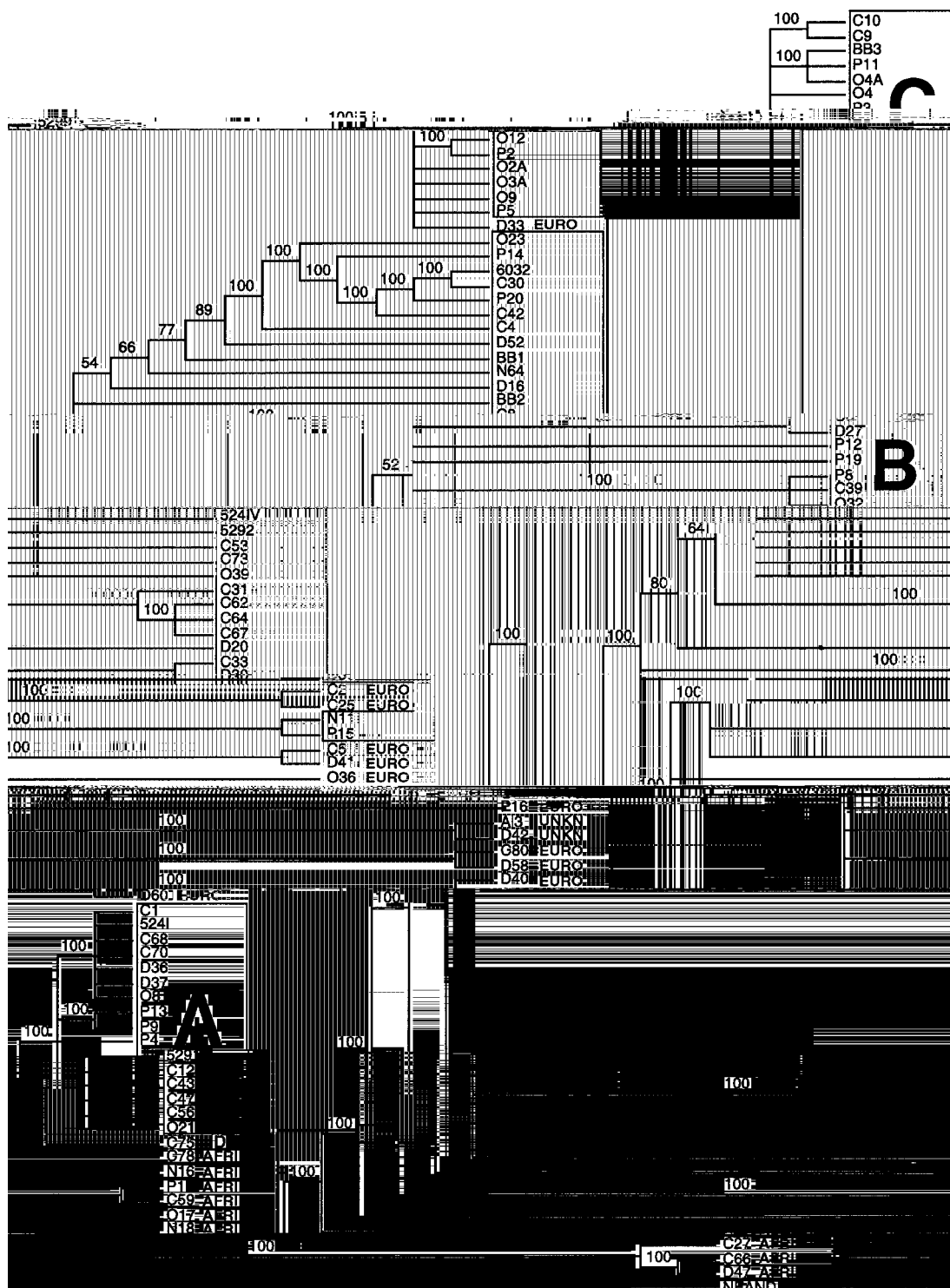
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The Mexican east coast is known to have greater African admixture, as is evident today in the physical appearance and culture of the populations residing there. This has also been seen in blood group marker studies, with east coast Mestizo communities having

Table 4
Non-Native American Haplotypes and HV1-Sequence Variation Observed for
Individuals from North-Central Mexico

	VARIABLE NUCLEOTIDE POSITION										
	1	2	3	4	5	6	7	8	9	10	
	11	12	13	14	15	16	17	18	19	20	
	21	22	23	24	25	26	27	28	29	30	
	31	32	33	34	35	36	37	38	39	40	
	41	42	43	44	45	46	47	48	49	50	
	51	52	53	54	55	56	57	58	59	60	
	61	62	63	64	65	66	67	68	69	70	
	71	72	73	74	75	76	77	78	79	80	
	81	82	83	84	85	86	87	88	89	90	
	91	92	93	94	95	96	97	98	99	100	
	101	102	103	104	105	106	107	108	109	110	
	111	112	113	114	115	116	117	118	119	120	
	121	122	123	124	125	126	127	128	129	130	
	131	132	133	134	135	136	137	138	139	140	
	141	142	143	144	145	146	147	148	149	150	
	151	152	153	154	155	156	157	158	159	160	
	161	162	163	164	165	166	167	168	169	170	
	171	172	173	174	175	176	177	178	179	180	
	181	182	183	184	185	186	187	188	189	190	
	191	192	193	194	195	196	197	198	199	200	
	201	202	203	204	205	206	207	208	209	210	
	211	212	213	214	215	216	217	218	219	220	
	221	222	223	224	225	226	227	228	229	230	
	231	232	233	234	235	236	237	238	239	240	
	241	242	243	244	245	246	247	248	249	250	
	251	252	253	254	255	256	257	258	259	260	
	261	262	263	264	265	266	267	268	269	270	
	271	272	273	274	275	276	277	278	279	280	
	281	282	283	284	285	286	287	288	289	290	
	291	292	293	294	295	296	297	298	299	300	
	301	302	303	304	305	306	307	308	309	310	
	311	312	313	314	315	316	317	318	319	320	
	321	322	323	324	325	326	327	328	329	330	
	331	332	333	334	335	336	337	338	339	340	
	341	342	343	344	345	346	347	348	349	350	
	351	352	353	354	355	356	357	358	359	360	
	361	362	363	364	365	366	367	368	369	370	
	371	372	373	374	375	376	377	378	379	380	
	381	382	383	384	385	386	387	388	389	390	
	391	392	393	394	395	396	397	398	399	400	
	401	402	403	404	405	406	407	408	409	410	
	411	412	413	414	415	416	417	418	419	420	
	421	422	423	424	425	426	427	428	429	430	
	431	432	433	434	435	436	437	438	439	440	
	441	442	443	444	445	446	447	448	449	450	
	451	452	453	454	455	456	457	458	459	460	
	461	462	463	464	465	466	467	468	469	470	
	471	472	473	474	475	476	477	478	479	480	
	481	482	483	484	485	486	487	488	489	490	
	491	492	493	494	495	496	497	498	499	500	
	501	502	503	504	505	506	507	508	509	510	
	511	512	513	514	515	516	517	518	519	520	
	521	522	523	524	525	526	527	528	529	530	
	531	532	533	534	535	536	537	538	539	540	
	541	542	543	544	545	546	547	548	549	550	
	551	552	553	554	555	556	557	558	559	560	
	561	562	563	564	565	566	567	568	569	570	
	571	572	573	574	575	576	577	578	579	580	
	581	582	583	584	585	586	587	588	589	590	
	591	592	593	594	595	596	597	598	599	600	
	601	602	603	604	605	606	607	608	609	610	
	611	612	613	614	615	616	617	618	619	620	
	621	622	623	624	625	626	627	628	629	630	
	631	632	633	634	635	636	637	638	639	640	
	641	642	643	644	645	646	647	648	649	650	
	651	652	653	654	655	656	657	658	659	660	
	661	662	663	664	665	666	667	668	669	670	
	671	672	673	674	675	676	677	678	679	680	
	681	682	683	684	685	686	687	688	689	690	
	691	692	693	694	695	696	697	698	699	700	
	701	702	703	704	705	706	707	708	709	710	
	711	712	713	714	715	716	717	718	719	720	
	721	722	723	724	725	726	727	728	729	730	
	731	732	733	734	735	736	737	738	739	740	
	741	742	743	744	745	746	747	748	749	750	
	751	752	753	754	755	756	757	758	759	760	
	761	762	763	764	765	766	767	768	769	770	
	771	772	773	774	775	776	777	778	779	780	
	781	782	783	784	785	786	787	788	789	790	
	791	792	793	794	795	796	797	798	799	800	
	801	802	803	804	805	806	807	808	809	810	
	811	812	813	814	815	816	817	818	819	820	
	821	822	823	824	825	826	827	828	829	830	
	831	832	833	834	835	836	837	838	839	840	
	841	842	843	844	845	846	847	848	849	850	
	851	852	853	854	855	856	857	858	859	860	
	861	862	863	864	865	866	867	868	869	870	
	871	872	873	874	875	876	877	878	879	880	
	881	882	883	884	885	886	887	888	889	890	
	891	892	893	894	895	896	897	898	899	900	
	901	902	903	904	905	906	907	908	909	910	
	911	912	913	914	915	916	917	918	919	920	
	921	922	923	924	925	926	927	928	929	930	
	931	932	933	934	935	936	937	938	939	940	
	941	942	943	944	945	946	947	948	949	950	
	951	952	953	954	955	956	957	958	959	960	
	961	962	963	964	965	966	967	968	969	970	
	971	972	973	974	975	976	977	978	979	980	
	981	982	983	984	985	986	987	988	989	990	
	991	992	993	994	995	996	997	998	999	1000	
	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	
	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	
	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	
	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	
	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	
	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	
	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	
	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	
	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	
	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	
	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	
	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	
	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	
	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	
	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	
	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	
	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	
	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	
	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	
	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	
	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	
	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	
	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230	
	1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	
	1241	1242	1243	1244	1245	1246	1247	1248	1249	1250	
	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	
	1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	
	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	
	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	
	1291	1292	1293	1294							



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