

Genetic studies in Medzev, an isolate in South-Eastern Slovakia.

1. History, demography, marriage patterns

Daniela Siváková^a and H. Walter^b

^aDepartment of Anthropology, Comenius University, Bratislava, Slovakia

^bDepartment of Human Biology, University of Bremen, Bremen, Germany

With 1 figure and 5 tables in the text

Summary: In Medzev, a village located in South-Eastern Slovakia, the secular variation of two indices of genetic isolation has been studied. It could be seen that this village was highly isolated till the beginning of the 20th century. Both indices show a tendency to increase in the first five decades of this century. For the entire period from 1766–1950 the coefficient of inbreeding estimated by the method of isonymy was found to be $F = 0.0074$ with different ratios of random (F_r) and non-random (F_n) components in particular periods. The coefficient of inbreeding estimated from the ecclesiastical dispensations for marriages comes to $F = 0.0019$. The genetic significance of the changes in the population structure of this village will be analyzed in further studies.

Zusammenfassung: In Medzev, einem Dorf im Südosten der Slowakei, wurde die säkulare Variation zweier Indices für genetische Isolation untersucht. Es konnte gezeigt werden, daß dieses Dorf bis zum Beginn des 20. Jahrhunderts stark isoliert war. Beide Indices ließen in den ersten fünf Jahrzehnten dieses Jahrhunderts eine ansteigende Tendenz erkennen. Der mittels der Isonymy-Methode errechnete Inzuchtkoeffizient beträgt für den gesamten Zeitraum von 1766–1950 $F = 0.0074$, wobei das Verhältnis der Random- (F_r) und Nonrandom-Komponenten (F_n) in verschiedenen Zeitabschnitten variiert. Der anhand der kirchlichen Heiratsurlaubnisse ermittelte Inzuchtkoeffizient beträgt $F = 0.0019$. Die genetische Bedeutung dieser Änderungen in der Populationsstruktur wird in weiteren Untersuchungen analysiert.

Introduction

This is the second part of a broader designed study in Spiš, a region, where since the 13th century infiltration of Germans has started being connected with the feudal state formation, the economic and social reforms of that time. Regarding the details of the aims of these studies and the history of German colonization we refer to Siváková et al. (1995). The fact that the German mining colonizers founded their settlements next to the Slovak or the Hungarian ones has given rise to trilingualism existing in the lower subregion of Spiš what was reflected on the three names given to the same villages and towns till the middle of the 20th century. This phenomenon has been preserved up to the present time exactly in Medzev (Kovačevićová 1990).

The aim of this paper is to present information concerning the origin of the population in the village Nižný Medzev (Unter-Metzenseifen), temporal changes in the mating structure and the breeding rate of this population, respectively.



Fig. 1. Geographical location of Medzev.

Material and methods

According to available historical sources the village Nižný Medzev (Meschenseuph) has been established in 1359. The village is situated on the south-eastern side of the Slovenské rudohorie mountains known for rich findings of silver, copper, antimony and mercury. Medzev, as the mining village, has been already mentioned in a contract concerning three iron forges that were built in 1366–1370. Mining industry was very important for the whole region and had a remarkable impact on local traditions and style of life. New mechanisms used in processing of ores based on water engine (applicable especially in Medzev) have probably stimulated an increase of immigrants in the middle of the 15th century. As a result, village Vyšný Medzev came into existence in 1427. The present day town Medzev (Fig. 1) was established in 1961 by fusion of villages Nižný Medzev (Unter-Metzenseifen) and Vyšný Medzev (Ober-Metzenseifen) that had been existing together since 1427. According to the Retrospective lexicon of Slovak villages the corresponding numbers of inhabitants and houses in Nižný Medzev are shown in Table 1.

Records from available parish registers of the village Nižný Medzev within the period 1766–1950 were used for estimation of temporal changes in the breeding structure of this population. The exogamy rate and the average marital distance have been studied as the indices of genetic isolation. The marriage distance, defined as distance between wife's and husband's birthplace has been measured along the most frequent routes of communication. For endogamous marriages the marriage distance was taken as zero.

Table 1. Number of inhabitants and houses in the village Nižný Medzev according to Retrospective lexicon of Slovak villages.

Year	1715	1720	1828	1869	1880	1890	1900	1910	1921	1930	1940	1950
No. of inhabitants	–	–	3424	3478	3216	2693	2805	2658	2670	2666	2400	2350
No. of houses	28	62	418	–	481	469	468	477	518	522	–	529

The coefficient of inbreeding (F) has been estimated from the frequency of isonymous marriages according to Crow & Mange (1965) and from dispensations granted by Church for consanguineous marriages.

For the pedigree analysis the genealogical data for at least 3 proceeding generations were available for 91 families of German origin and have been collected by interviewing the inhabitants in Medzev during a field work.

Results and discussion

Exogamy rate

The exogamy rate and the average marital distance within the entire period (1766 to 1950) in the investigated village are shown in Table 2. This shows that the frequency of exogamous marriages was very low till the middle of the 19th century and did not exceed 4%. In time span of 1856–1860, a first increase of the frequency has been recorded up to nearly 12%, but till the end of the 19th century it remains below 20%. This coincides quite well with historical records as since the second half of the 19th century prosperity of Lower Spiš started to decay due to changes in technologies thus a lot of inhabitants were forced to come frequently to towns where modern ironworks had been built due to more accessible importation of ores (e.g. Krompachy or Hungarian Ozde) (Kovačevićová 1990). These circumstances could consequently increase spatial exogamy. The exogamy frequency over 44% has occurred in 1936–1940 time span, although continuous increase of exogamy has been evident since the beginning of the 20th century. Here one can also find a parallel with some historical events. From the year 1918 onwards, the ironworks in Spiš were not able to compete with those using more effective technologies; after 1923 thousands of people lost their jobs that led to considerable emigration as well as increasing migration (Kovačevićová 1990).

Variations in the frequency of exogamy in N. Medzev are fairly similar to those reported by Ferák & Kroupová (1977) for nine regions in Slovakia where a general tendency for increasing exogamy rate was observed within the first 3–5 decades of this century while in the previous centuries it remained relatively constant. Unlike this study, changes in the population structure in N. Medzev started earlier as compared for example with villages of German origin in the region Horné Ponitrie, where increased exogamy up to 27% was observed after the World War II.

In comparison with a village Chmel'nica in the upper subregion of Spiš, the exogamy in N. Medzev attains lower values than in Chmel'nica at least up to the middle of the 19th century (Siváková et al. 1995). This intra-subregional variation could partially stem from the village size because as a rule: the smaller the village, the higher the exogamy rate. Both villages, however, deviate, regarding the time of manifested changes in exogamy rate, from several Slovakian villages where marked increase of exogamy up to 50–80% has been recorded until after the World War II (Ferák & Kroupová 1977, Kroupová et al. 1980).

Average marriage distance

The secular variation of the mean marriage distance is shown in the Table 3. It can be seen that till the middle of the 19th century, the mean value was very low and only once (1816–1820 time span) exceeded 3 km. From 1856 till 1930 fluctuating

Table 2. Secular development of the exogamy rate (in %) and mean marriage distance (in km) in Nižný Medzev. N = number of contracted marriages, n = number of exogamous marriages.

Years	N	n	Exogamy %	Marriage distance km
1766-1770	173	1	0.58	0.05
1771-1775	185	0	0.00	0.00
1776-1780	166	0	0.00	0.00
1781-1785	156	0	0.00	0.00
1786-1790	118	0	0.00	0.00
1791-1795	207	1	0.48	0.03
1796-1800	195	1	0.51	0.04
1801-1805	176	3	1.70	0.63
1806-1810	196	1	0.51	0.04
1811-1815	147	3	2.04	0.44
1816-1820	150	6	4.00	3.17
1821-1825	184	5	2.72	0.31
1826-1830	157	6	3.82	0.64
1831-1835	185	6	3.24	0.81
1836-1840	156	0	0.00	0.00
1841-1845	171	0	0.00	0.00
1846-1850	204	0	0.00	0.00
1851-1855	153	2	1.31	0.48
1856-1860	163	19	11.66	6.74
1861-1865	192	35	18.23	11.17
1866-1870	168	32	19.05	5.95
1871-1875	125	20	16.00	9.02
1876-1880	124	21	16.94	13.00
1881-1885	102	12	11.76	5.01
1886-1890	87	10	11.49	6.76
1891-1895	75	14	18.67	8.89
1896-1900	103	17	16.50	10.63
1901-1905	67	16	23.88	10.23
1906-1910	104	26	25.00	16.51
1911-1915	84	11	13.10	6.42
1916-1920	84	13	15.48	8.10
1921-1925	111	15	13.51	5.37
1926-1930	130	38	29.23	8.85
1931-1935	81	23	28.40	92.62
1936-1940	102	45	44.12	13.03
1941-1945	82	32	39.02	27.89
1946-1950	116	48	41.38	24.42

values of this index (between 5.01 and 16.61) have been observed. The increase of the average marital distance is not so marked as the increase of exogamy rate in the corresponding years, although, one could expect intercorrelation of both indicies. However, as the exogamous marriages have been registered also marriages where one partner came from the village Vyšný Medzev situated in a short distance, which could partly explain this phenomenon. In 1931-1935 time span, amazing increase of marital distance to nearly 93 km was recorded. Within this time span most marriages contracted from over 100 km distance could have been concentrated (see Table 3). Table 3 presents distribution of the marriage distance (in %) in particular periods.

Table 3. Distribution of marriage distances (in %) in Nižný Medzev (1766–1950); N = number of marriages.

km	1		2		3	
	N	1766–1800	N	1801–1900	N	1901–1950
0	1197	99.7	2805	93.0	695	72.3
-10	3	0.3	84	2.8	122	12.7
-20	0	0.0	19	0.6	16	1.7
-30	0	0.0	7	0.2	6	0.6
-40	0	0.0	24	0.8	43	4.5
-50	0	0.0	19	0.6	6	0.6
-60	0	0.0	3	0.1	2	0.2
-70	0	0.0	9	0.3	3	0.3
-80	0	0.0	4	0.1	7	0.7
-90	0	0.0	3	0.1	3	0.3
-100	0	0.0	2	0.1	1	0.1
>100	0	0.0	38	1.3	57	6.0
Total	1200	100.0	3017	100.0	961	100.0

In each period endogamous marriages have prevailed followed by exogamous ones up to 10 km. In the second and the third periods 1801–1900 and 1901–1950, respectively, more marriages up to 40 km distance as well as those over 100 km distance appeared. In comparison with the village Chmel'nica where the mean marriage distance in the entire period (1781–1949) was low (about 8 km) and all exogamous partners originated actually from near or neighbouring villages within the area (Siváková et al. 1995), this index is much higher in N. Medzev. Here it should be noted that in literature it is often emphasized the fact that preservation of trilingualism in Medzev was advantageous for inhabitants and helped them to find new facilities of subsistence in the remote towns, mainly after 1923 when considerable emigration came true (Kovačevićová 1990). Here, it is worthwhile mentioning one more point that not all the exogamous marriages registered in N. Medzev may represent the actual inflow of exogamous partners into the village. In former times, the marriage used to be registered in the bride's community, however, usually it was

Table 4. Expected and observed proportions of isonymy in village Nižný Medzev (1766 to 1950), and the estimated values of coefficient of inbreeding (F), random inbreeding (F_r), and nonrandom inbreeding (F_n).

Period	1	2	3
	1766–1800	1801–1900	1901–1950
No. of marriages	1200	3018	961
No. of isonymous marriages	26	105	26
Frequency of observed isonymy $\times 10^2$	2.17	3.48	2.71
Frequency of expected isonymy $\times 10^2$	1.97	1.14	2.34
$F \times 10^3$	5.4	8.7	6.8
$F_r \times 10^3$	4.9	2.8	5.8
$F_n \times 10^3$	0.5	5.9	0.9
Ratio F_r/F	0.91	0.32	0.85

the bride who followed her husband's dwelling though, the exchanges between any two communities as regards the sex were usually symmetrical. In Slovakia, this has been demonstrated by Ferák & Kroupová (1977) and Valšík & Bojnová (1968).

It can be stated that the secular development of mean marriage distance in N. Medzev till 1920 resembles those observed in different villages in Slovakia, where the mean values in the same time ranged between 0–15 km (Ferák & Kroupová 1977). Unlike this study, the marked increase of this index in N. Medzev has been recorded before and not after the year 1950 which used to be considered as the year of dramatic changes in the economic and social conditions of the rural population in Slovakia.

Coefficient of inbreeding

Table 4 summarizes data on the inbreeding coefficient (F) measured by marital isonymy and its random (F_r) and nonrandom (F_n) component. Table 4 shows that the frequency of observed isonymy attained the highest value between 1801 and 1900. It was greater than random (expected) isonymy so there was a positive non-random component in all time periods. The distribution of F_r and F_n on the total inbreeding was different in particular periods. While between 1766–1800 F , contributed mostly to the total F due to restricted population size in the breeding units (F_r/F ratio is equal to 0.91), between 1801–1900 almost the entire inbreeding effect, reaching the highest value in this period, is attributable to nonrandom component ($F_r/F = 0.32$). The preference of consanguineous matings in this period is partly demonstrated with the evaluation of F from dispensations granted by Church (Table 5), though, the estimation covers only 1833–1869 time span from the whole period. However, the same evaluation was impossible to realize in the two other periods. The total F equal to 0.0068 in the third period (1901–1950) is lower than that one from the village Chmel'nica in the Upper Spiš ($F = 0.0089$, 1901–1949; Siváková et al. 1995), but it is within the range of the "endogamous villages" from the study conducted by Ferák & Kroupová (1977), where F ranged between 0.0056–0.0084 in 1910–1950 time span. The coefficient of inbreeding from isonymy for the whole period (1766–1950) of this study comes to $F = 0.0074$ and is

Table 5. Coefficient of inbreeding in dispensated marriages from Nižný Medzev (1833 to 1869). R = Coefficient of relationship corresponding to cath. degree.

Relationship (Roman Cath. degrees)	R	No. of dispensa- tions granted	F
II in III	1/4	5	1/8
III	1/8	17	1/16
III in IV	1/16	16	1/32
IV	1/32	17	1/64
Total		55	
No. of marriages contracted in 1833–1869		1286	
F from dispensation			$F_d = 0.0019$

II in III = uncle/niece; III = first cousins; III in IV = first cousins once removed; IV = second cousins.

comparable with the results previously reported from the other villages in Slovakia (Sršeň & Koska 1976, Kroupová et al. 1980, Sieglóvá et al. 1988).

Isonymy has been found to overestimate inbreeding also in a number of other studies (Hussels 1969, Morton & Hussels 1970, Friedl & Ellis 1974, Hurd 1983, James 1983, Sorg 1983).

Apart from the inbreeding measured by means of marital isonymy, we have evaluated the inbreeding recorded in ecclesiastical dispensations for marriages. The time period for which reliable entries were present is 1833–1869. The period prior to 1833 being unavailable and that after 1869 being inconsistently recorded. Table 5 shows number and type of dispensations and the inbreeding coefficient for the population as measured by dispensations (F_d). Within this period 1286 marriages were contracted and 55 dispensations were granted for consanguineous marriages with different degrees of relationship (Roman Catholic usage). The coefficient of inbreeding from dispensations is $F_d = 0.0019$. This value is similar to those reported by Semanová (1971), Ferák & Kroupová (1977) and Siváková et al. (1995) for the other villages of Slovakia (F_d equal to 0.0058, 0.0014, 0.0027, respectively). In order to illustrate how far data obtained from the frequency of dispensations agree with the frequency of isonymous marriages, we have calculated F from isonymy for the same time period as for which F_d was established. Here 41 out of 1286 marriages were isonymous ($I = 0.0319$), which yields the inbreeding coefficient $F = I/4 = 0.0079$. Thus, four times greater than F_d estimated from the dispensations. Siváková et al. (1995) observed in the Slovakian village Chmel'nica (1801–1900) F from isonymy (F_i) three times the F from dispensations (F_d). Ferák & Kroupová (1977) reported from another Slovak village (1780–1870) F_i nearly five times as much as the F_d . In contrary to this study, we cannot confirm that mates with identical surname apply more often for a dispensation (only 6 out of 41 isonymous marriages). However, weaknesses of each of the above mentioned methods have already been discussed in literature (Crow & Mange 1965, Robinson 1983, Lasker 1985).

Pedigree analysis

Pedigree information from the current population sample provides an incomplete picture. For each interviewer of German origin born before 1950 genealogical data were available for 3 preceding generations. Among 91 married couples no consanguineous relationships has occurred and 8 out of these were isonymous: a proportion of 0.0879. When these marriages are used in the manner described by Crow & Mange to estimate the inbreeding coefficient the result is $F = 0.0219$. It seems that in this population the tendency of people to marry near their natal household and the clustering of surnames, gives rise to the number of isonymous marriages prevails over the tendency to marry someone close. In N. Medzev this high value of F implied by isonymy can be accounted for e. g. by polyphyletic origin of surnames due to existence of V. Medzev since 1427, although, surnames are highly family specific in Slovakia and they retained their rather village-specificity (Valšík & Bojnová 1968). On the other hand, in the pedigrees remote consanguineous matings may have been missing. Several other studies, as reviewed by Lasker (1985), showed rather poor correspondence of estimates of inbreeding from surnames and from pedigrees.

Because in our sample the estimate of inbreeding based on doubtful key assumptions of the isonymy method (monophyletism of surname origin and an absence of

immigration) it is not accurate and the inferences made about mating behaviour would not be valid for this population.

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Address for correspondence:

Dozent Dr. Daniela Siváková, Department of Anthropology, Comenius University, Mlynska dolina B2, SK-84215 Bratislava, Slovakia.