Z Rechtsmed 85, 1–4 (1980)

Zeitschrift für
Rechtsmedizin

Originalarbeiten / Original Works

Results on Forensic Application of the C3 System*

G. Geserick, O. Prokop, and H. Waltz

Institut für gerichtliche Medizin der Humboldt-Universität zu Berlin, Hannoversche Straße 6, DDR-104 Berlin

Summary. The results of the application of the C3 system to 155 cases of disputed paternity are presented. In this preselected material (none of the 234 accused men could be excluded by any of the usual markers of red blood cells and serum) 23 men were excluded. Of these 23 exclusions, 17 could be examined in the HLA-system and were confirmed by this system. In 211 mother-child pairs no theoretically impossible combinations were observed.

Key words: Blood groups, C3 system – Complement

Zusammenfassung. Das C3-System wurde bei 155 Fällen strittiger Vaterschaft eingesetzt. Es handelte sich um ein ausgelesenes Untersuchungsgut, da in allen Fällen die 234 beschuldigten Männer durch den Einsatz der üblichen genetischen Erythrozyten- und Serummerkmale nicht auszuschließen waren. 17 der 23 ausgeschlossenen Probanden konnten im HLA-System untersucht werden, wobei alle Ausschlüsse bestätigt wurden. Die C3-Typisierung von 211 Mutter-Kind-Paaren erbrachte keine Abweichungen von der Erbregel.

Schlüsselwörter: Blutgruppen, C3-System – Komplement

Since the discovery of the C3 polymorphism in man [1—4] it has been intensively studied from two points of view: population genetics and forensic application. The numerous studies of the frequency in different populations and of the inheritance were summarized by Rittner and Rittner [5], and by Geserick [6]. The results of C3 typing in our population ($n = 1326$; allele frequency: $C3^F = 0.1836$, $C3^S = 0.8130$, $C3^{var.} = 0.0034$) and of family studies have been given elsewhere [7]. In addition, we have previously reported on 240 families typed with the Pt tech-

* Vortrag auf dem „III. Workshop on the Genetics of the Complement System" in Köln, Mai 1979

Offprint requests to: Dr. G. Geserick (address see above)

0044-3433/80/0085/0001/$ 1.00

nique in the C3c conversion product [8]. In these as in the collected family data, no exception from the postulated mode of inheritance was observed.

Based on these results, we have examined the usefulness of applying the C3 system in cases of disputed paternity. Besides, in the present study we undertook to investigate the inheritance of both common and rare types in mother-child pairs.

Material and Methods

Blood samples from 155 paternity cases (155 mothers with 156 children and 234 accused men) and from 211 mother-child pairs were taken from the routine case material of our institute. None of the 234 accused men could be excluded by any of the commonly used genetic markers tested in earlier medico-legal expertises (including AB0, MNSs, Rh, P, Kell, Se, Hp, Gc, Gm[1/2/4], Inv[1], AcP, PGM, AK, ADA, and in part EsD, GPT). The serum was separated promptly and tested immediately or kept at −20°C for a few days until determination.

C3 typing was performed in agarose gel electrophoresis as described by Teisberg [9] with unimportant modifications.

Results and Discussion

Using the C3 system, in 23 of 155 expertises including 234 men the alleged father was excluded. Of these 23 exclusions, 17 could be examined in the HLA-system and all of these were confirmed by this system. The various combinations of mother, child, and false father are to be seen in Table 1.

The exclusion of 23 from 234 men (= 9.8%) in our study is not in contradiction with the computed single exclusion change of 13% for non-fathers, because in our material the assumed fathers are preselected. Therefore, a great part of our cases will include biological fathers.

The phenotype distribution within 211 mother-child combinations is represented in Table 2. We found no theoretically impossible combinations. This result

Table 1. C3 system: Exclusions in disputed paternity cases

Mother	Child	Assumed father	Observed	Confirmed by the HLA-system
			n	*n*
F	F	S	1	—
FS	S	F	1	1
FS	F	S	5	4
S	S	F	3	2
S	FS	S	11	8
FS	FS0.4	S	1	1
SS0.4	FS0.4	S	1	1
Total			23	17

Table 2. C3 system: Mother-child pairs

Mother		Children						
		F	FS	S	F0.8S	F0.3S	FS0.4	SS0.4
F	5	2	4	/	/	/	0	/
FS	66	11	26	30	0	0	1	0
S	137	/	32	105	1	1	/	0
F0.9F	1	1	0	/	/	/	0	/
FS0.4	1	0	0	/	/	/	0	1
SS0.4	1	/	0	0	0	0	1	0
Total	211	14	62	135	1	1	2	1
		Total						216

can confirm the regular inheritance of the common alleles $C3^F$ and $C3^S$ as well as the rare allele $C3^{S0.4}$ (2 cases).

From our studies we conclude in agreement with other reports [7, 10—17] that the C3 system can successfully be used in the examination of disputed paternity cases.

References

1. Wieme RJ, Segers J (1968) Genetic polymorphism of the complement component C'3 in a Bantu population. Nature 220:176
2. Alper CA, Propp RP (1968) Genetic polymorphism of the third component of human complement (C'3). J Clin Invest 47:2181
3. Azen EA, Smithies O (1968) Genetic polymorphism of C'3 (β_{1c}-globulin) in human serum. Science 162:905
4. Rose M, Geserick G (1969) Ein neuer Serumproteinpolymorphismus: Pt. Erste Hinweise für eine genetische Steuerung. Acta Biol Med Germ 23:351
5. Rittner C, Rittner B (1974) Report 1973/1974 of the reference laboratory for the polymorphism of the third component (C3) of the human complement system. Vox Sang 27:464
6. Geserick G (1977) Genetische Komplementgruppen des Menschen (C3 und C3c=Pt). In: Perlick E, Plenert W, Prokop O, Stobbe H (eds) Forschritte der Hämatologie, Vol 4. Johann Ambrosius Barth, Leipzig
7. Geserick G (1978) Eine neue Gruppe genetischer Marker im Humanserum: Das Komplementsystem. Kriminal Forens Wiss 33:91
8. Geserick G, Blaszczyk J, Iwanow R (1970) Familienstudien zur Darstellung der Genetik des Serummerkmals Pt. Z Immun Forsch 140:50
9. Teisberg (1970) High voltage agarose gel electrophoresis in the study of C3 polymorphism. Vox Sang 19:47
10. Prokop O, Rose M, Geserick G (1970) Die Anwendung des Posttransferrinpolymorphismus (Pt) in der Vaterschaftsbegutachtung. Dtsch Gesundh Wesen 25:1910
11. Teisberg P (1971) Genetics of the C3 system. Family, mother/child and association studies. Hum Heredity 21:1
12. Teisberg P (1972) Applikation of the C3 system in paternity cases. Vox Sang 22:3
13. Farhud DD, Walter H (1973) Verwendung des C3 (β_{1c}-Globulin)-Polymorphismus bei der Vaterschaftsbegutachtung. Z Rechtsmed 72:225

14. Geserick G, Rose M (1973) The discovery of a genetic polymorphism in a conversion product of C3 by starch gel electrophoresis: the Pt system. Methodological, genetic, and forensic aspects. Vox Sang 25:9
15. Kühnl P (1973) Advantages of C3 typing on agarose gel electrophoresis with special reference to the determination of rare types. Vox Sang 25:14
16. Spielmann W (1973) Results on formal and population genetics including their application in cases of disputed paternity. Vox Sang 25:14
17. Hoste B, Brocteur J, Suys J, Andre A (1977) Polymorphism of the third component (C3) of complement and of transferrin (Tf) in Belgium. Z Rechtsmed 80:55

Received October 18, 1979