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## DERMO-NITRATE TEST IN CUBA

Israel Castellanos†

In the writings published concerning the paraffin or the dermo-nitrate test, the investigators of the Republic of Cuba are not conceded the tribute they merit, and for this reason the author considers it fitting to write a brief history of this test. It is herein desired to demonstrate the large part which the Cuban experts and investigators have played in the discovery, development, and perfection of these proposed methods of investigation. Cuba has, without a doubt, contributed most intensely toward giving, technical precision to the process, and it has broadcast and popularized the paraffin test which some experts accept with misgivings or limitations.

The sulphuric solution of diphenylamine, which some authors term the Fernandez Benitez reagent, was not conceived by this Cuban chemist. Therefore, in justice, it should be called the Guttman reagent in honor of its true author. The original idea of using sulphuric acid and diphenylamine as a reagent to discover the presence of nitrates is not that of a Cuban, but the use of paraffin for the gathering of products proceeding from the discharge of a firearm so that they might be subjected to the corresponding microchemical test was created in Cuba. In effect, when some years ago the then Chief of Police of the Republic, General Armando de la Riva, met death on the Prado, one of Havana's most beautiful thoroughfares, a very clamorous case was opened in which the indignation of honest citizens became confused with the sectarian interests of the political parties in contention. During the course of the trial, many firearms identification problems were encountered, one of the questions being whether or not the shots had been fired at close range. This author will offer no opinion as to which of the experts were in the right; but from that fiery argument set forth before the Courts of Justice, he does wish to take one historical fact—that which fixes the paternity of the paraffin test. Doctors Jose A. Fernandez Benitez and Alfredo Basarrate, professors in the Cuban Laboratory of Legal Chemistry, to whom the trousers of the victim were given for analysis, made the following official report.

“Since the request of the Court refers only to the investigation it is necessary, in view of the laceration of the cloth of the trousers at the point examination is to be made, to separate a few small pieces thereof to submit them to analysis. Examination was first

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made of the perforation with a strong magnifying glass, also the edges and proximities thereof without proving the existence of blue-black residues produced by burned gunpowder when discharges are made from a very short distance. Notwithstanding this, the pieces of cloth which were separated were put to soak in distilled water for three hours and the liquid thus obtained was filtered and then submitted to the action of the following reagents: barium chloride, silver nitrate, acetate of lead, without the revelation of the presence of sulphates nor sulphides which are the residual products left by the inflammation of gunpowder; neither was it possible to discover in the liquid the presence of black, insoluble powders (carbon), which is another element entering into the composition of gunpowders. In view of which, the experts report that the borders of the perforation in the trousers examined and which appears to have been produced by a projectile from a firearm do not show the presence of burned powder."

The prosecuting attorney, to refute the report of the government's experts, appointed the chemists Gonzalo Iturrioz and Gaston Alonso Cuadrado. Doctor Alonso Cuadrado rendered an extensive report which he presented to the Academy of Science of Havana and in which he stated:

"Due to the fact that small particles of powder do not adhere to woolen materials, and the facility with which those caught between the fibers are dislodged through most any mechanical means, we fear we will not find sufficient particles of powder in General Rivas' uniform to make the demonstration due to the length of time elapsed; but our companion, Dr. Gonzalo Iturrioz, informs me that in such cases he applies a very simple procedure consisting in the use of a plain surface of paraffin as though it were a sponge applied to the cloth, and even though only a very few particles adhered to the surface, they would be sufficient to produce the reaction of the sulphuric solution of diphenylamine, a procedure which is at once so simple and yet so efficient that it will demonstrate the existence of even one particle of a compound nitrate. While recognizing the high degree of merit of this procedure and frankly admitting their unfamiliarity with it, the chemists doubted its efficiency to such an extreme that it was difficult for one of them to see the reaction; a circumstance which would have been unfavorable to our professional standing had it not been for the sensitiveness of the reagent, as only a very few particles could possibly be present after the length of time elapsed and due to the quantity we had already gathered from the trousers, drawers, and shirt by applying the paraffin to the perforation existing therein as a powerful magnifying glass barely allowed us to find a few scattered particles. Therefore, the positive results of our process is not due to the application of diphenylamine as a reagent, but to what may be

termed from now on as the Iturrioz' paraffin process, as for all other purposes, the blue coloration of nitrate-compounds with that substance is one of the most widely known reactions in organic chemistry."

Thus it appears that Professors Fernandez Benitez and Basarate of Cuba's Legal Chemistry Laboratory did not create the paraffin method but that, on the contrary, they were incredulous spectators of its creation and introduction into criminal investigation. Following the spirit of justice which always characterized his life as a scientist, Doctor G. Alonso Cuadrado requested that the new paraffin test be called the "Iturrioz' process." Following the example of that venerable master, this author now claims for Cuba the honor of having created the paraffin test and for Doctor Gonzalo Iturrioz, the right to give his name to the new, efficient process for the investigation of the presence of nitrates coming from the discharge of a firearm. In the future, therefore, the process which has up to the present time been popularly referred to as the "paraffin test" should be called the "Iturrioz' test."

Subsequent to the introduction of this test by Dr. Iturrioz, other Cuban scientists have participated in the refinements of the techniques which have lead to modern methods so universally used. A careful study of the bibliography of this interesting subject from its origin reveals prominent contributions by Cuban investigators. The following brief outline summarizes the history of the test as it appears in documents which have come to the attention of the author during his research in this subject.

1909. Chavigny in a case of a supposed suicide by means of a French military rifle employed, at the suggestion of Girard, brucine to discover the presence of nitrates.
1911. Wellenstein and Kober proposed diphenylamine as a reagent for the detection of powder residues.<sup>1</sup> In connection with research work many experiments were made with a Browning pistol, and it was found that the residuum left by the explosion was revealed by diphenylamine and concentrated sulphuric acid, a fact which they published in May, 1911.
1911. Lochte pointed out during the VII Convention of Legal Medicine of Germany that the diphenylamine test was positive with black as well as smokeless gunpowder.
1914. Doctor Gonzalo Iturrioz of Cuba created a new, simple process for the investigation of nitrate products proceeding from the discharge of a firearm, consisting not in the application of diphenylamine as a reagent but "in the use of a plain surface of paraffin pressed against the cloth as though it were

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<sup>1</sup> This test as a means of detecting nitrates was apparently first proposed by E. Kopp in 1872, followed by C. Laar in 1882 and I. Guareschi in 1896.

a sponge," as was graphically stated by Doctor G. Alonso Cuadrado. Report No. 1959 from the Laboratory of Legal Chemistry of Cuba, dated July 6, 1914, establishes the memorable introduction into criminal practice of the method then termed the "paraffin impression."

1922. Fernandez Benitez of Cuba published in the *Review of Legal Medicine of Cuba* an article entitled "Some Considerations Concerning Stains Produced by the Discharge of Firearms," which obtained high acclaim.
1923. Balthazard in the *Annals of Legal Medicine of France* made an analysis of the work of Fernandez Benitez, who had not mentioned Dr. Gonzalo Iturrioz.
1924. Strassman suggested that a plate of glass covered with paraffin be pressed against materials so that the grains or particles of powder will adhere thereto and then effect thereon directly the chemical reactions.
1931. T. Gonzalez performed the paraffin test for the first time in Mexico. Gonzales modified the technique of Iturrioz by using melted paraffin which was applied to the back of the hand by means of a brush. After the paraffin had set this cast was removed and the chemical test applied to the inner surface of the cast.
1933. T. Gonzalez of Mexico performed the paraffin test in the United States for the first time, making practical demonstrations in the Police Department of Milwaukee, which were described by Mr. J. Kluchesky in his report.
1937. I. Castellanos modified the paraffin test by introducing the topographic location of powder residue and its chemical verification.
1939. I. Castellanos and R. Plasencia conceived and adopted the making of paraffin gauntlets, a refinement on the technique of Gonzales.<sup>2</sup>

Doctors Gonzalo Iturrioz and G. Alonso Cuadrado were accidental experts in the sensational trial resulting from the death of Havana's Chief of Police. After this trial they returned to their professional labors and never appeared again before the Courts as experts. On the other hand, however, the Laboratory of Legal Chemistry, between the years 1914 and 1941, according to data in its files, has used on 63 different occasions paraffin blocks, sheets, or lumps to gather the residue left by a discharge. During this time the Iturrioz test has been undergoing modification and perfection by the National Bureau of Identification. As the result of these im-

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<sup>2</sup> See Castellanos, I. and Plasencia, R., "The Paraffin Gauntlet: A New Technique for the Dermo-Nitrate Test," *J. Crim. L. & Criminology (Pol. Sci. Sec.)* 32 (4): 465-467 (1941).

provements since the year 1939, paraffin has been melted, and gauntlets made thereof in accordance with the technique previously published by this writer.<sup>2</sup>

With these improvements has also come a greater use so that between the years 1936 and 1941 1,031 paraffin tests pertaining to 458 persons were performed with the following distribution:

Year	No. of Subjects	Tests Made
1936	8	32
1937	34	116
1938	14	56
1939	39	103
1940	174	379
1941	189	345
Total	<u>458</u>	<u>1031</u>

In the beginning, the paraffin test was purely superficial or epidermic, for the malleable substance employed was simply pressed over the surface of the skin so as to absorb the particles of powder which might be adhered thereto. At the present time, however, the paraffin is melted and applied in the form of a gauntlet, making the test deep or intradermic, and for this reason the term "dermo-nitrate test," as this process is called by Americans, is quite fitting. When hot paraffin is applied to the skin it causes the pores to dilate and exude any nitrate particles which may be lodged therein.

The Cuban National Bureau of Identification has surpassed in every sense the laboratories of the police departments of both Europe and America. The number of tests made steadily increases, and in view of its efficacy it is applied almost daily. Due to the political clashes which stained this country with blood recently, the tests multiplied very fast, up to the point where the laboratory under the author's direction broke the record by making 100 gauntlets in one day. On the basis of available statistics he considers himself in a position to state authoritatively that this laboratory holds the record for the largest number of dermo-nitrate tests made up to the present time. But this writer is not satisfied with simply having completed the largest number of tests because they have been requested by the authorities in charge of criminal cases, but it gives him deep satisfaction to have been able to prove that the idea of the paraffin test belongs to Cuba, that it was created and introduced by Dr. Gonzalo Iturrioz, and that the National Bureau of Identification of Cuba, under his direction, has been able to lend precision, perfection, and dignity to the so-called dermo-nitrate test.