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IT'S NOT WHAT IS UNDER THE FINGERNAIL THAT COUNTS…

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The Armed Forces DNA Identification Laboratory (AFDIL) is a division of the Armed Forces Medical Examiner System (AFMES) located in Rockville, MD. AFDIL provides DNA typing for the AFMES, the Department of Defense (DoD), and other agencies of the Federal Government, for the purpose of identifying human remains. AFDIL's mitochondrial DNA section is dedicated to the forensic typing of mitochondrial DNA (mtDNA) for the Joint POW/MIA Accounting Command - Central Identification Laboratory (JPAC-CIL) to assist in identifying remains of American service members repatriated from previous conflicts including Southeast Asia, Korea, and World War II. Together, AFDIL and JPAC strive to attain the greatest possible accounting of Americans lost during wartime. Mitochondrial DNA analysis is used on more than 75% of the cases JPAC-CIL processes. AFDIL typically receives skeletal or dental remains from which scientists attempt to extract mtDNA using organic extraction techniques. There is a high success rate in typing gravely degraded remains due to the large number of mitochondria present in each cell. Mitochondrial DNA is inherited maternally and due to its innate stability, it can be used to identify degraded remains by comparing an unknown sequence to that of known maternal references across several generations. To demonstrate the applicability of mtDNA for identification purposes, this poster will present a particular case of an unusual sample submission. Although mtDNA has a low power of discrimination and a more extensive processing time, AFDIL utilizes its ability to exclude individuals as contributing factors when identifying deceased persons involved in a particular crash site. The story began sixty-two years ago on Saturday, April 29, 1944. Eighteen crews from the 392nd bomb group participated in a mission over Berlin. This mission quickly set precedence and became known as one of the most merciless air attacks ever fought over Berlin during that period. Around noon on April 29, a B-24J bomber, belonging to the 578th squadron, was shot down over Germany, killing all 10 crewmen aboard. Eyewitnesses saw the plane crash and shortly thereafter become engulfed by flames. Six decades later in 2004, after the wreckage was unearthed by amateur aviation archaeologists, a team of scientists from JPAC-CIL recovered skeletal remains, ID media, and aircrew equipment, from the site near the village of Meitze, Germany. Upon further dissection of a weathered, decades-old, leather flight glove, Dr. Laura Miller discovered a single fingernail associated with a distal phalanx. In 2005, AFDIL received twelve skeletal elements and the single fingernail for mtDNA analysis, along with family reference specimens from nine of the ten crew members. Five distinct mtDNA profiles were developed from the skeletal samples, four of which were consistent with four of the family references provided. The fingernail provided unexpectedly high quality DNA for analysis and was consistent with results obtained from six of the skeletal remains. This poster illustrates the standard operating

procedures used by the AFDIL staff to generate a mtDNA profile from a remarkable specimen. Although other skeletal elements from the same individual appear to be represented, this case illustrates the possibility of accounting for the fate of a military casualty based solely on data from a fingernail, by unequivocally placing an individual in the aircraft at the time of the crash. While it is a common practice to type nuclear DNA found beneath fingernails, this case clearly signifies the ability to type mtDNA from an aged, withered, environmentally challenged, fingernail. The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of the Army, the Department of Defense or the U.S. Government.