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# *Canities Subita*: A Reappraisal of Evidence Based on 196 Case Reports Published in the Medical Literature

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#### Abstract

We have reviewed the medical literature on unusually rapid *Canities* of body hair to assess whether the reported clinical evidence can be explained with the current hypotheses of pathogenetic mechanisms. We screened the medical literature from 1800 onward, searching for as many case reports as possible. We assessed literature in Dutch, English, French, German, Italian and Spanish and included all cases, which contained an explicit mention or description of unusually rapid graying or whitening of hair. Case reports were classified into three categories: Cases are "authenticated" when the authors personally observed the rapid color change, "non-authenticated" when they saw the subject only after the alleged color change and "anecdotal" when authors were told about the case by a third party. In total, we found 196 cases of which 44 were authenticated. These studies reported the graying of human hair in the context of aging, somatic diseases, emotional trauma or stress and psychiatric disorders. Numerous cases involved not only scalp hair, but also beards, eyelashes and other body hair. Several authors stressed that there was no alopecia. Although plausible explanations exist to explain *Canities subita* occurring together with an effluvium, the observation of viable hair losing color along the axis within a timespan shorter than its growth rate remain as yet unexplained.

Keywords: Alopecia areata diffusa, Canities subita, sudden hair blanching

## INTRODUCTION

The process of graying or whitening hair is called *Canities* and normally occurs as one of the signs of aging. Pigment production by melanocytes in the hair matrix area surrounding the dermal papilla is thought to cease gradually, resulting in slow outgrowth of graying hair at the pace of normal hair growth. Yet, not all hair bulbs decrease pigment incorporation in the growing hair at the same time – instead, single gray hairs start appearing interspersed among the pigmented ones, colloquially called "salt and pepper pattern". As the differentiated hair shaft contains no live cells, it is not thought to be able to undergo any active changes. In contrast to this, unusually rapid loss of hair color has been reported in the medical and non-medical literature. The prevailing theory states that apparent sudden graying may occur because of a selective loss of pigmented hairs due to *alopecia areata diffusa*.[<u>1</u>,<u>2</u>] However, along with other authors, one of us (A. A. N.) observed the case of a 54-year-old woman whose hair had allegedly turned white

within "a few weeks" without her having noticed the loss of hair.[3] Because this patient's observations may have been incomplete, we decided to survey the medical literature on unusually rapid whitening of hair, limiting our collection to case reports published from 1800 to the present. We assessed Dutch, English, French, German, Italian and Spanish publications and included all cases containing an explicit mention or description of unusually rapid graying or whitening of hair. We found reports of 196 cases. Of these, 44 were reported by physicians who saw their patients before and after the color change, often witnessing the graying process (authenticated cases) and we will focus our presentation primarily on these first-hand accounts. Many of these authors were renowned physicians of national and international reputation. In addition, 82 cases were reported by physicians who saw or treated the patients only after the alleged sudden color change (non-authenticated cases), sometimes on the next day and 37 cases were merely reported to the physicians (anecdotal cases). In the remaining 33 cases, the precise circumstances of the observation were unclear.

#### OVERVIEW OF CASES OF UNUSUALLY RAPID WHITENING OF BODY HAIR

#### Studies concerning color changes of single hairs due to aging

When Neurologist Brown-Séquard was 45 years of age, he first discovered white hairs in the anterior parts of his beard and plucked them out.[4] After a few days, he discovered new white hairs in his beard and plucked them out. He repeated this procedure throughout the 5-6 weeks, always finding after 2-5 days fully developed new white hairs in his beard that had blanched on their entire length, apparently overnight. Brown-Séquard stressed that his observations were beyond doubt. Around the same time, Pincus presented the results of detailed investigations of single hairs that women of different ages had lost.[5] After microscopic analyses, Pincus stated that the graying of hairs usually began at their base because pigments would cease to be produced in the scalp and the hair would then grow without pigmentation. However, he also found that in the white sections of several hairs, their fine structure was swollen and filled with air. Pincus concluded that in these cases, the change of color had occurred in the already existing and pigmented matter of the hairs by the inclusion of air. Later, Naegeli studied the graying process in women with a long black hair.[6] He observed that the color change began both at the base and at the tips of the hairs and that it would often progress fast, up to 1 cm in 2 days. Thus, entire hairs would be blanched within a few weeks and often faster. Galewsky similarly stated that entire hair shafts can gradually become white due to the aging.[7] Ephraim questioned several hairdressers on this topic. They held the opinion that pigmented hairs can become white on their entire length.[8]

#### Cases reported in the context of intense pain or somatic diseases

Like Brown-Séquard, Anstie reported color changes in his own hair.[9] Whenever he suffered severe neuralgia attacks, a part of his right eyebrow and scalp hairs on the right side of his head turned white. Yet, the original hair color was always restored after a few days. Anstie stressed that there was no alopecia and that he observed this phenomenon in several of his patients as well. Similarly, Urbantschitsch described a case in which, in addition to brittleness and alopecia, many hairs turned white during severe attacks of neuralgia.[10] In this case, the discoloration of hairs was permanent. Raymond witnessed the rapid color change in the hair of a 38-year-old woman together with his colleague Vulpian, the discoverer of adrenalin. [11] Patient suffered from extreme neuralgia and emotional anxiety. The physicians observed that her hair changed its color almost entirely within 5 h and they excluded the possibility that her hairs had been dyed before. The process of decoloration of hair continued during the following 2 days, after which her hair started to fall out. Gowers reported the case of a man who suffered a traumatic meningeal hemorrhage over the left hemisphere.[12] During the 3 days, he lived after the injury, the right half of his brown moustache and beard became almost white. The scalp hair was not affected. A similar non-authenticated case was described by Brissaud, who reported a perfect *Hemicanities* in a 63-year-old man, which had developed within 1 day after a hemorrhage.[13] Perry related 2 other cases of this kind, one involving a 12-year-old

boy.[<u>14</u>] The *Hemicanities* in the non-authenticated case described by Loeb was said to have followed a hemorrhage within 8 days.[<u>15</u>] Other remarkable authenticated cases, in which rapid poliosis was attributed to somatic causes include Dewees (during parturition),[<u>16</u>] Compagne (during a severe fever in a 36-year-old woman),[<u>17</u>] Brée (coinciding with progressive vitiligo in a 22-year-old man)[<u>18</u>] and Lieber (during several cycles of menstruation in a 16-year-old teenager).[<u>19</u>]

A peculiar subset of 30 cases concerns the rapid whitening of eyelashes [Table 1]. Eighteen of these were related to severe pain in this region or to diseases of the eye. The remaining cases were reported in the context of emotional trauma (9 cases) or without discernible trigger (3 cases). A classic case concerning eye diseases was reported by Schenkl.[20] He reported that 5-6 cilia had turned white within 3 days in a 9-year-old boy whose left eye had been enucleated. Schenkl had observed the wound closely and he paid special attention to the lashes, many of which turned toward the interior of the eye socket.

#### Cases reported in the context of emotional stress or trauma

Of the 196 cases in our collection, 126 were attributed to frightful or emotionally shattering experiences [ Table 1]. For example, in March 1923, a 62-year-old widow was injured and suffered extreme fright when she slipped and fell.[21] She remained in the hospital for 3 months. The woman had dark hair, which measured 80 cm at the occipital region of her head. On the morning of the second day in hospital, the basal areas of the hairs of the frontal hemisphere of her head had turned white on a length of 1 cm. Initially, the hair of the occipital hemisphere of her head showed no change. While the whitening progress on her frontal hemisphere continued, but declined in velocity, the 80 cm long hairs of the occipital skull hemisphere began to show a different kind of color change. When patient left the hospital after 90 days, these hairs consisted of an irregular mixture of hairs that had remained dark and that had blanched at different locations. Many of the hairs had blanched only in their distal regions. On the last examination of the woman, performed 92 days after her release from the hospital, the basal whitening of her frontal hair was 10 cm and the occipital area of her head had turned entirely gray. Only a few weeks before, the woman had first noticed a loss of hair. She stated that she never used hair dye and according to enquiries that Sticker made among the people who knew her, she had always had the long dark hair that she had at the time she slipped. Similarly, Baelz has reported that the hair of a female patient of his changed from dark to largely gray within 6 months.[22] Irregular strands of white hairs were mixed with darker hairs. The white hairs were blanched on their entire length of about 25 cm. The color change began after the woman was rescued from a shipwreck. Another case, reported by Pöhlmann, involved a 34-year-old man who was rescued with difficulty after a mountaineering accident. [23] He visited Pöhlmann because of frostbite on his hands and feet. Pöhlmann observed that patches of poliosis and *alopecia areata* developed during the course of several weeks in the man's beard and scalp hair. These patches had begun to appear 3-4 days after the accident. Similarly, Bertrand in Bernard and Dubreuilh observed the development of both poliosis and patches of *alopecia areata* in patients after emotional strain. [24,25] Vogel stated that his own hair turned white overnight after the death of his wife, just before he reached his 30<sup>th</sup> year.[26] Parry reported the case of a 54-year-old man whose black hair turned gray within half an hour during a frightening military examination by his captors.[27] Perry saw a man whose black hair turned gray 1 day after he was met with a "terrible calamity."[14] Ferguson observed the graving of a black-haired acquaintance over 5 days when the latter suffered from emotional distress.[28] Laumonier saw a young mother appear with white hair at the funeral of her 12-year-old daughter, who had died from a flu.[29] Gomer observed sudden Canities in a soldier at the front.[30]

#### Cases reported in combination with alopecia

We have already mentioned cases, which involved unusual *Canities* accompanied by alopecia. [10,11,21,23,24,25] Similarly, Groeger related a case, in which there was total whitening of black scalp hair within 3 days, but in which alopecia occurred only in the eyebrows and eyelashes.[31] It was unclear

whether the Groeger was a direct witness of these changes. Ephraim described the case of a 63-year-old patient whom he had seen the day after a fall and again 6 weeks later.[8] The man reported that he had noticed hair loss 2 weeks after the accident and that he had turned almost entirely white within the 3<sup>rd</sup> week. Initially, patient had had only a few white hairs on top, with some graying at his temples. Stankler and Bewsher reported analogous, but non-authenticated case of a 50-year-old patient.[32] His wife, his medical practitioner and a neighbor who worked at the hospital to which the man was referred, confirmed that his hair had turned from black to white within 3 weeks for unknown reasons. In addition to this progressive Canities, alopecia was noted. A case reported by Hoff also involved both alopecia and Canities.[33] Hoff, then director of the Medical University Clinic in Frankfurt, examined the patient 7 months after the reported color change of his hair, but the case was well authenticated by direct witnesses, among them Professor Walter Parissius, chief physician of the Knappschafts-Hospital in Essen, Germany, who had referred the patient to Hoff. Patient, a 40-year-old miner with dark blond hair, became ill, collapsed and was visited by a physician. During the night, the man and his wife noticed that when he ran his fingers through his hair, much of his dark hair came out in tufts. The hairs that remained on his head had turned white. His skin displayed vitiligo universalis. The next day, he was admitted to the Knappschafts-Hospital, He remained hospitalized for several days, during which time the whitening of other body hair progressed. Within 3 days, his eyebrows and eyelashes had turned white and after 10 days, the hair on his chest and abdomen had whitened. His pubic hair had turned completely white a few days later. Finally, about 1 month after the onset of his disease, the axillary hairs had also turned white. Moreover, the color of his irides had changed from dark brown to a light blue. The miner was presented at a dermatological convention on May 27, 1955 in Essen, where Hoffmann met and talked with him as well. [34] Hernández y Vázquez reported a similar non-authenticated case, in which a 52-year-old man developed total whitening of all scalp, beard, axillary and pubic hair as well as alopecia, within 2 days after a severe emotional affliction.[35] Two other sources reported non-authenticated cases, in which alopecia occurred shortly after sudden whitening of scalp hairs of their patients.[36,37]

In nine non-authenticated reports, unusually rapid Canities was attributed to alopecia alone. Their authors argued that predominantly pigmented hairs were lost, but white hair remained on the scalp.[2,38,39,40] In this way, the false impression that the hairs had turned white was created. This process of whitening due to the rapid alopecia took between 3 days and 3 weeks; in one case the process took 3 months.[41] None of these cases was preceded by sudden emotional strain; although, one patient reported a distressing period of family trouble.[40] Thus, just as there are case reports of rapid Canities without alopecia and cases involving both rapid Canities and rapid alopecia, there are cases of only rapid alopecia (areata diffusa) of predominantly pigmented hairs. This finding highlights the multifaceted phenomenology of disorders of the hair and scalp as stressed by Dubreuilh.[25] Some physicians may have failed to note that some of the "only alopecia" cases might have involved unusual Canities as well. For example, in one case patient's scalp hair, measuring about 10 cm in length, had whitened strikingly and progressively within 3 months, beginning on the crown of her head.[41] She had reported loss of hairs, but the authors did not specify their color. Still, they speculated that the progressive graying resulted from the progressive, selective loss of pigmented hairs. A hair count performed by the authors themselves; however, showed that the average hair density was in fact greater in the crown area, which displayed maximum whitening, compared to the areas in which the hairs were not yet affected by the progressive Canities and which contained only "rare" gray hairs.

### Cases reported in the context of psychiatric disorders

Rapid whitening of hair has also been reported in the context of psychiatric disorders. As in some cases involving intense periodic pain, [9, 19] reversible color changes were reported in this category. For example, Reinhard reported a periodic change of hair color in a 13-year-old patient with severe mental disabilities who also suffered from apparent epileptic fits. [42] Her hair color changed repeatedly from a yellowish

blond to a reddish-golden color and back again. The reddish color lasted for 7 or 8 days, always correlating with periods of mental agitation. There was no alopecia, the possibility of hair dyes was excluded and several caregivers and physicians witnessed these repeated color changes. A similar case involved a 21-year-old woman who suffered from schizophrenia.[43] During the phases of intense emotional agitation, a 3 cm wide strand of her blond hair turned white. It resumed its original color after 4 days, but it returned during four more attacks of mental disturbance. Heinicke stressed that there was no alopecia. Other well-documented observations of hair color change during psychotic fits were made by Mirto and Räuber. [44,45] Lastly, the head and beard of an extremely frightful 34-year-old man who suffered from delirium tremens and hallucinations had turned from blond to gray overnight on the morning of the 4<sup>th</sup> day in hospital as noted by the attending physicians and by other patients who had seen him before.[46] Upon closer investigation, inclusions of air were discovered in the blanched hair shafts that were removable by incubation in water, ether or turpentine oil with subsequent restoration of the original hair color.

#### DISCUSSION

In a survey of the medical literature about sudden or unusually rapid whitening of fully developed hair shafts, we found reports of 196 cases. The collection contains numerous apparently well-authenticated case reports by direct eyewitnesses. In only 6 of 44 authenticated and 16 of 82 non-authenticated cases was alopecia reported to be associated with the rapid color change. Thus, the selective loss of pigmented hair by alopecia areata diffusa may not explain all these cases. Several other hypotheses have been put forward, [47,48,49] most prominently inclusion of air in hair shafts without pigment destruction.[46] Conspicuous alterations of the internal fine structure of hair shafts, usually associated with the inclusion of the air, have been reported in 16 cases of this review. Such alterations were not reported by others, but they did not have access to hair from cases with rapid Canities.[49] However, air inclusions in the hair cortex can definitely create a loss of color intensity as is known from the disease pili annulati that produces dark and bright stripes in the hair.[50] Interestingly, this process is reversible as more distal pili annulati lose their bands eventually, which is explained by the collapse of the air-filled cortex. However, whether the new air inclusions can be created by internal processes in the fully differentiated hair remains unclear and will be interesting to investigate. It will be relatively easy to determine prospectively whether the new cases of rapid *Canities* contain air inclusions in the cortex and what physical influences could lead to this phenotype. This must be differentiated from air in the medulla, which is a common phenomenon. Although no conclusive proof exists that rapid Canities can occur without concomitant alopecia areata diffusa, the sheer number of authenticated cases suggesting this call for a more systematic investigation of what factors may prompt loss of hair color. Such an investigation may provide new insights into the process of physiologic Canities.

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## **Figures and Tables**

## Table 1

Features of the cases	Authenticated cases	Non-authenticated cases	Anecdotal cases	Unclear	Sum
Total number of cases	44	82	37	33	196
Affected type of hair					
Scalp hair	38	68	36	28	170
Eyebrows	3	15	1	3	22
Eyelashes	7	15	2	6	3●
Beard	7	8	2	2	19
Other body hair	2	7	0	1	10
Apparent trigger of the onset of Canities					
Aging, or no discernible trigger	5	13-	1	2	21
Intense pain or somatic disease	12	19	4	4	39
Psychiatric disorder	6	3	1	o	10
Emotional stress	21	47	31	27	126
Associated specifics					
Alopecia	6	16	1	0	23
Poliosis	15	34	6	3	58
Vitiligo	2	7	0	ø	9
Subject 4-18 years old	7	12	2	1	22

Overview of specific features of 196 cases of unusually rapid *canities* reported in the medical literature from 1800 onward

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