



2 Cultural evolution as a possible triggering 3 or causative factor of common baldness

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Summary Common baldness (alopecia) increasingly affects a higher number of individuals at earlier ages, independently of gender. One of the reasons could be lack of knowledge concerning its etiology. The human being has evolved to become a naked monkey, although there is no apparent reason to continue the evolutionary process up to becoming a bald monkey. According to this theory, common baldness is a degenerative process derived from certain inadequate cultural practices, such as excessive hair cutting or certain types of haircuts that prevent contact among hairs themselves and limit outside contact in ways that would alleviate balding. Blocking the flow of sebum towards the base of the hair follicle – and so interfering with the arrival of the stem cells to the dermal papilla with consequent hair miniaturization – ends up being the first negative physiological effect derived from certain cultural habits. As time goes by, other mechanisms become altered, which leads to a less and less reversibility of the process.
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18 Introduction

19 It is generally accepted that loss of memory in
20 people over 60 years of age is mainly due to cul-
21 tural factors [1]; that is to say, the viability or
22 destruction of determined neurons is due to certain
23 behaviours of the individual. This process could be
24 similarly related to the problem of common bald-
25 ness.

26 Human ancestors in the African savannah, over
27 3.5 million years ago, adopted bipedism as a step
28 towards evolution. In such way, the human being
29 improved his watching possibilities over the high
30 grass. His hands got rid of the locomotion process
31 and, this way, he had better access to feeding re-

sources that had been formerly unreachable. Such 32
upright walking modified our hair. We gradually 33
eliminated and miniaturized our body hair, while 34
our scalp hair grew longer and denser to improve 35
the thermal isolation of the brain. In parallel, body 36
hair loss avoids excessive hosting of parasites and, 37
consequently, the time invested in peer hygiene is 38
reduced in favour of practicing some other cultural 39
habits. 40

Human hair is the most evolved type of hair in 41
any species. The pilosebaceous unit consists of the 42
hair shaft, outer and inner sheaths, the dermal 43
papilla, the sebaceous gland, the erecting muscle, 44
the vascular system, the annex nervous system, 45
and the bulge region that provides stem cells for 46
epidermis and hair regeneration. Any hair shows a 47
cycle with an anagen (growth) phase followed by a 48
catagen (resting) phase and a telogen (fall out) 49

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50 phase after which the process starts again. More-
51 over, the determining and characteristic feature of
52 the human hair is its asynchrony; that is to say, its
53 autonomy to self-regulate its own hair cycle inde-
54 pendently from the hairs next to it [2]. This unique
55 trait allows us to shed our hair without realizing it,
56 retaining our image, which eases other's recogni-
57 tion of us and consequently our recognition of
58 others, taking a huge step towards the species'
59 cultural evolution.

60 The pilosebaceous unit is among the most com-
61 plex mechanisms of the human body and provides a
62 location where most of the biological systems in-
63 tervene, which makes the study of human hair a
64 huge puzzle. The primitive germs of the piloseba-
65 ceous unit are exclusively formed during embryo
66 development, one of the crucial stages for physi-
67 ological development. On the human body, apart
68 from those specialised forms comprising eyelashes,
69 eyebrows, ear and nose, two types of hair grow:
70 that which is in the scalp and the corporal or body
71 type. Scalp hair starts growing immediately after
72 birth. Body hair is mostly delayed until puberty
73 when the body begins preparing itself for repro-
74 ductive tasks.

75 Hair loss might be caused by a great number of
76 factors that usually affect hairs diffusely, in a
77 general rather than localised way. The difference
78 between common baldness and other hair loss
79 phenomena lies in the fact that it only affects
80 certain regions of the patient's scalp. Some re-
81 searchers have tried to discriminate different types
82 of hair on the scalp. The problem is that these
83 differences have been only observed in individuals
84 affected by common baldness, but they have not
85 been corroborated in healthy patients [3]. Tech-
86 niques of hair transplantation are often cited as
87 evidence of the genetic differences among hairs on
88 the scalp, but nowadays the concept of donor
89 dominance of donated hair over resettled areas is
90 uncertain [4]. It is not only questioned but many
91 experts agree that the most effective way to sur-
92 gically fill in "resistant" hair is scalp reduction of
93 the areas affected by removal of bald scalp and
94 closing the adjacent areas together, although even
95 this effect is often temporary. All these factors
96 lead me to think that there are not different types
97 of hair on the scalp and that control mechanisms
98 are the same in women and men. Strong reasons
99 would be necessary so that nature evolved differ-
100 ent hairs on the scalp.

101 Baldness classification scales in both women and
102 men have been modified and interwoven as inves-
103 tigation have advanced. The number of cases of
104 common baldness in male patients suffering hair
105 loss similar to female patients is rising [5], as are

the numbers of females suffering male pattern 106
baldness. 107

Theory 108

At the beginning of the 20th century, the French 109
dermatologist Raimond Sabouraud talked about the 110
relationship of baldness and seborrhoeic problems 111
[6]. Sebum production by the sebaceous gland is 112
critical for hair and epidermis health. Sebum is 113
mainly formed by triglycerides and wax esters, 114
both unstable materials susceptible to oxidation 115
and which must be renewed continuously. This 116
need to create and to eliminate sebum makes it 117
flow through a centrifugal track impregnating all 118
the surfaces running both outwards from and in- 119
wards toward the hair follicle. In the author's 120
opinion, the central hypothesis is that sebum 121
components not only are discharged to the skin 122
surface but also exert effects on the lower/proxi- 123
mal hair follicle, including even the anagen hair 124
bulb and its dermal papilla. Although the inward 125
flow is not supported yet by bibliography, there are 126
facts that suggest it, such as the observation that 127
sebum is accumulated at the base of the hair fol- 128
licle in damaged hair, proving that sebum has 129
reached this area. Moreover, it has been acknowl- 130
edged that within the hair medulla the highest 131
concentration of lipids is found and that its chem- 132
ical composition is very similar to that of sebum 133
[7,8]. 134

The inward directional flow is not easy, since the 135
pathway is narrow and sebum must slide between 136
the epidermis connective tissue and the outer root 137
sheath of the hair. Once the path is chosen, the 138
sebum must necessarily arrive at the end of the 139
dermal papilla. There is no possible way back. 140
Blocking this sebum flow toward the inner hair 141
follicle seems to be the initial triggering cause of 142
the common baldness degenerative process 143
(Fig. 1). 144

At this point the key question would be: why is 145
the flow of sebum at this area eventually blocked? 146
The only plausible reason for biologically causing 147
the obstruction of sebum flow would be a drastic 148
increase of the inward sebum flow. Talking in 149
economic terms, when the demand of a product 150
increases or decreases disproportionately, there 151
appears the risk of destabilisation for the rest of 152
products. If the imbalances persist for a long pe- 153
riod, costs go higher. In a similar way, if the as- 154
similation of outwards sebum is interrupted, it is 155
very likely for the inwards flow of sebum to be al- 156
tered as well. 157

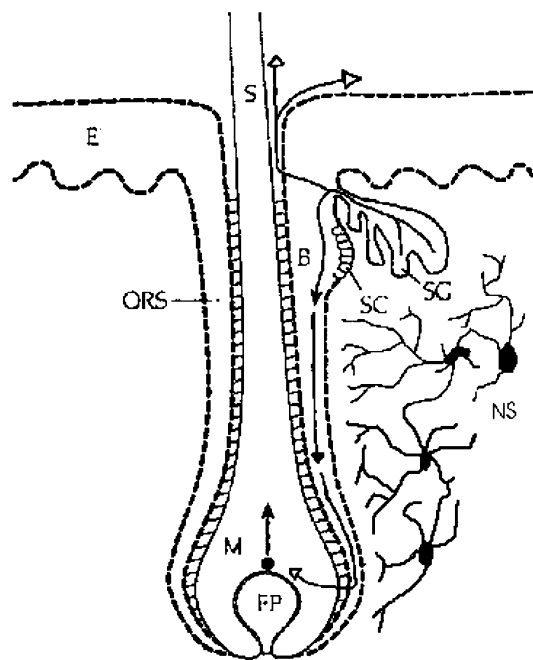


Figure 1 Eschematic Diagram of Pilosebaceous system/unit. Due to the easy oxidation of the sebum produced by the sebaceous gland, the latter must be created and eliminated continuously. A small part of the sebum produced will make its way through the base of the hair follicle. Blocking of the sebum flow could represent the trigger cause of common baldness. B – bulge; E – epidermis; FP – follicular or dermal papilla; M – matrix keratinocytes; NV – nerve system; ORS – outer root sheath; S – hair shaft; SC – stem cells; SG – sebaceous gland.

hormonal, immunological, circulatory and neuronal systems, making the process less and less reversible.

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Cultural observations

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This theory can provide a satisfactory explanation for the different percentages of common baldness affecting different people, depending of the type of hair they have. The most susceptible individuals to suffer from baldness will be those who cut their hair excessively short, whose hair is thin, straight or with low hair density. On the contrary, it is very difficult that individuals with high hair density and thick hair suffer from baldness, even if they wear short hair.

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This theory also would clearly explain why the incidence of common baldness is different in both sexes, and it is due to the fact that women usually wear longer hair than men. However, it must be mentioned that nature provides both sexes with the capacity to have long hair. It is not something exclusive to the female gender. Long hair allows the elimination of sebum, even in the hair located at the top of head, since sebum can move in a longitudinal way along its surface till it reaches the absorbent surface. Similarly, it can be explained why there is less repercussion in people with a high hair density, or with thicker or curly hair, since these physical characteristics of hair influence the favouring or impedance of sebum outward flow. The theory explains why certain ethnicities or cultures such as Native Americans, rastafaris, gypsies, etc. do not suffer from common baldness. However, the contrary example would be those women who suffer from baldness since they cut their hair shorter due to aesthetic reasons (especially the part of the "fringe" or "bangs" over the forehead area). Such is the case of the cultural groups like the Zo'e or the Yomibato in the Amazon jungle or the Palawans in the Philippines.

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Many people affected by common baldness have noted that they started to suffer from it during military service. This theory could explain this fact. The difference in hair length is the key. Military people, skinheads and others wear their hair short and therefore they can induce problems with the sebum flow. On the contrary, hippies, Hindus, etc. wear long hair. Therefore while some of them are susceptible to suffering from baldness, others are not.

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This also explains why it is so easy to induce alopecia at the crown area with what is called tonsure, a practice undertaken by certain religious

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158 Sebum has two ways of being eliminated toward
159 the outside. One is a longitudinal way, sliding
160 through the hair shaft (from the base of the hair
161 shaft to the tip of the hair), and the other one is a
162 transverse way, transferring it from one hair to its
163 neighbour (more remarkable if the hair density is
164 higher). The sebum produced is continuously
165 eliminated by combing, washing, brushing the hair,
166 touching or massaging it or even while we rest our
167 head in an armchair. However, the most important
168 and recurring agent accomplishing this function is
169 the bed's pillow, as it is an absorbent surface able
170 to eliminate the sebum. (Human beings spend one
171 third of their existence sleeping.) It is interesting
172 to underline that no baldness happens in areas
173 where this drainage cannot be interrupted. All
174 these factors lead to the idea that lack of contact
175 with an absorbent surface firstly causes the prob-
176 lems related to sebum drainage.

177 In my opinion, the triggering cause of the pro-
178 cess of alopecia is the detention in the sebum flow
179 moving towards the root of hair. Such a simple fact
180 brings with it an alteration of all the biological,

233 orders, since they isolate certain hairs in such a
234 way as to stop sebum flow.

235 Biological observations

236 As has been mentioned, sebum is an agent sus-
237 ceptible to oxidation, and during this process the
238 quality and its composition are modified, increas-
239 ing its viscosity and compactness, altering the
240 acidity of the environment and modifying its bio-
241 logical signals. Common baldness is a degenerative
242 process, and blocking the sebum flow seems to be
243 the trigger that leads to a chain reaction process.
244 These posterior facts have been often considered
245 as causal elements in baldness, but arguments have
246 failed when trying to prove such theories. They
247 have been proven to be side effects that increase
248 the problem's seriousness and that might make it
249 less reversible.

250 A very important detail to take into account is
251 the fact that sebum carries biological signals such
252 as androgens and stem cell, which are created in
253 the bulge area. (Notice its location just below the
254 sebaceous gland duct.) Blocking the inward-flowing
255 sebum seems to provoke a series of effects such as:

- 256 • Blockage of physical material that feeds the hair
257 shaft. Apparently sebum does not reach the hair
258 dermal papilla.
- 259 • Blockage of certain biological signals such as our
260 own sebum substances or the information car-
261 ried thereby. When the quantity of sebum is in-
262 creased, the amount of hormonal components
263 grows as well, especially dihydrotestosterone
264 (DHT) and an excess of this substance seems to
265 produce negative effects upon hair growth, par-
266 allel to an increase of the production of the se-
267 baceous gland.
- 268 • Increase of microorganisms fed from sebum lip-
269 ids. Such an increase can provoke the body's im-
270 mune reaction of rejection. Nowadays it is
271 commonly accepted that pilosebaceous units
272 do belong to the immune system.
- 273 • Decrease of the production pace and blockage of
274 stem cells, preventing arrival to the dermal pa-
275 pilla, leading to the process of hair shaft minia-
276 turization in all cases of common baldness [9].
- 277 • The blockage of sebum flow provokes oxidation
278 and an increase of free radicals and higher se-
279 bum viscosity. This phenomenon may alter its
280 composition qualities and consequently, differ-
281 ent kinds of rejection are more likely to happen.
- 282 • Due to action of lipoxygenases, free fatty acids
283 appear and their peroxidation leads to neuro-

- 284 prostanes that cause death by apoptosis in the
285 neural system. The author postulates that some-
286 thing similar happens in the hair system [10].
- The tissue next to the hair loses vascularisation
287 and the amount of sebum increases in the areas
288 around the hair root and the latter is likely to
289 suffer episodes of inflammation. Such inflamma-
290 tion of the tissues makes the way narrower and
291 further hinders the mobilization of the sebum.
- Stem cells leaving the bulge region will not reach
292 their initial destiny and their pluripotentiality
293 allows them to create different cellular tissues
294 as keratinocytes, provoking fibrotic processes
295 around the hair follicle.

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All these processes can happen one after the
299 other one or in a parallel way. The process of
300 common baldness becomes more complicated and
301 difficult to reverse.
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Scientific data and pertinent trials 303

It must be admitted that hard data trying to find
304 the joint link between common baldness and hair-
305 style are practically nonexistent, despite the great
306 number of facts that can be observed in daily life.
307 This might be due to the fact that science does not
308 mesh with the always-changing dictates of fashion,
309 which are part of human cultural evolution. But in
310 order that a hypothesis can be turned into a theory,
311 it must fulfill the minimum requirements of the
312 scientific method, and one of these is that the in-
313 vestigator can reproduce and repeat the results.
314 The question would be: Is it possible to induce
315 common baldness in healthy individuals? Nowadays
316 there are many ways to cause hair loss, as it could
317 be due to drug side effects (for example chemo-
318 therapy), serious deficiencies of nutrients, post-
319 traumatic or even very stressful situations. But all
320 these causes lead to a generalized loss of hairs, not
321 just to part of them as happens in the case of
322 common baldness; and on the other hand, once the
323 causative agent is eliminated, hair is usually re-
324 covered in a natural way. My hypothesis should
325 prove that specific areas of alopecia are caused
326 just by hindering the normal elimination of sebum.
327 Shortening the length of hair is enough to stop the
328 longitudinal flow of sebum, but in order to stop the
329 transverse flow among hairs, it is necessary to cut
330 hair even shorter; that is, to shave it in order to get
331 a total isolation of hair, even if it is thick with high
332 hair density. Therefore, tonsure becomes the ap-
333 propriate tool, and its practice proves us the high
334 efficacy of this method. A similar reasoning would
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336 be able to explain the great number of people with
337 receding hairlines, probably due to an excessive
338 cut of the hair at the front area.

339 On the other hand, my hypothesis would be
340 strengthened if it were proven impossible to induce
341 baldness in areas that are usually preserved. For-
342 tunately, daily observations give examples in this
343 sense. A very clear one would be bald individuals
344 who decide to shave their heads. They must do it
345 daily because they are not able to eliminate the
346 hairs at the sides. This fact is probably due to the
347 impossibility of stopping the sebum flow, since at
348 these areas the pilosebaceous follicles can drain
349 sebum in a direct way to an absorbent surface
350 through repeated contact while we sleep.

351 Another very important detail is that tonsure
352 was also practiced on novices, some of them be-
353 fore puberty. It can be found even on girls and
354 women, with the same inexorable results: the ap-
355 pearance of a bald area in all the cases. These facts
356 seem to point out that in order to make a bald
357 area, it is much more useful to negatively modify
358 the elimination of sebum rather than the general
359 hormonal influence of people. In brief, it seems
360 that tonsure is a universal method to produce a
361 localised alopecia on any person.

362 Conclusion

363 According to the theory, common baldness is a
364 degenerative process derived from certain inade-
365 quate cultural practices. This phenomenon is ob-
366 served in both men and women and it affects a
367 greater number of individuals nowadays, but it
368 seems easy to prevent just by growing hair long
369 enough to prevent the loss of contact among hair
370 shafts and the outside, and this way, maintaining
371 the outward sebum flow. However, once common
372 baldness exists, the process must be stopped or
373 hair loss is unavoidable. As time goes by, the pro-
374 cesses increase and they become less reversible. So
375 there is a paradox: it is useless to try to recover
376 hair lost during the past years while it could be very
377 easy to prevent its loss. Therefore, prevention
378 appears to be the most suitable solution.

379 This theory has some points to be stressed:

- 380 • It tries to make clearer the initial and triggering
381 cause of common baldness, which is the same in
382 men and women regardless the localization of
383 the hair in the scalp. It does not distinguish alo-
384 pecia areata, receding hairlines, etc.
- 385 • The theory gives relevance to the sebum and its
386 foundations, supporting the general opinions of

the people who suffer common baldness: those 387
people realized that in a determined stage of 388
common baldness, there is a sebum alteration 389
over the scalp. As a result, this theoretical de- 390
velopment restructures the old theory of 391
“clogged follicles” and gives relevance to bald- 392
ness caused by seborrheic dermatitis. 393

- In case this theory were confirmed, the impor- 394
tance of the genetic component in common 395
baldness would be reduced. Genetics deter- 396
mines the type of hair, predisposing to common 397
baldness in individuals with thin and low density 398
hair, but it does not destine irremissibly these 399
people to develop baldness. Therefore, by mod- 400
ifying a specific component of cultural evolution 401
– in this case a fashion – the problem in ques- 402
tion could be solved in an effective and preven- 403
tive way. 404
- Besides the entire body of supporting scientific 405
evidence, I would like to mention Occam’s raz- 406
zor: “Pluralitas non est ponenda sine neccesi- 407
tate,” and its corollary: Given more than one 408
theory or solution to a problem, it is much more 409
interesting and fruitful to study in depth the sim- 410
plest of the theories. 411

The author is trying to contribute his point of 413
view in order to solve a problem that affects a high 414
number of individuals, although he is also aware 415
that this thought-provoking theory will give rise a 416
lot of skepticism. Common baldness is not a deadly 417
condition, although it causes serious problems to 418
people’s self-image and self-esteem, especially to 419
women. Opening new scientific research regarding 420
this subject is suggested, as well as research on the 421
sebum flow into the hair follicle and its connection 422
with the transport of stem cells or label-retaining 423
cells, which are extremely important to the bio- 424
logical mechanism of hair. 425

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