Fine Wine and Gout

Subjects: Cultural Studies | History | Rheumatology
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From ancient times to the present day, gout has been associated in the popular and scientific literature with wealthy men who overindulge in fancy foods, fine wine, and debauchery. Curiously, amongst diseases, gout was thought to be good, a malady to be accepted because of otherwise beneficial effects on health, and longevity.

Keywords: wine ; gout ; tophaceous gout ; lead ; lead nanoparticles

1. What Is Gout?

Gout, recognized as a specific disease, has afflicted individuals since ancient times [1]. However, as discussed by Porter and Rousseau [2], until the mid- twentieth century there was considerable controversy on just what gout might be. Even after Leeuwenhoek, 1679, demonstrated crystals in tophaceous chalk [3], and after Garrod in the 1850s showed that crystals in tophi contained urate [4], and that gouty patients had increased blood uric acid [5][6], and even after Barwell [7], 1881, carefully described urate crystals within synovial fluid and on joint surfaces, there were doubts from learned physicians about gout's salient features. Ewart [8] in 1896, and an anonymous commentary [9] in *The British Medical Journal* 11 January 1908, talked of gout and goutiness in terms of an unknown metabolic defect which was accompanied by increased blood uric acid, without mentioning the role of crystals within joints or tophi. Referring to his own illness which had its onset 35 years previously, the famous anatomist Fredric Wood Jones discussed gout in *The Lancet*, 31 January 1948, attributing pathogenesis to an autonomic vasomotor disorder, again without any discussion of crystals [10]. The association of crystals with the pathogenesis of acute gout, universally recognized today [11], was not established until McCarty in 1962 distinguished gout from pseudogout by polarized light microscopy of crystals in synovial fluid. Further, McCarty demonstrated experimentally the inflammatory properties of monosodium urate crystals in vivo [12][13][14][15]. As an aside, Barwell, in 1881, described both urate crystals on joint surfaces, and crystals, typical of calcium pyrophosphate dihydrate crystal deposits, within cartilage, but did not recognize that two distinct crystal types were present in the joint, albeit at different histologic sites [7].

2. Gout and Fine Wine

Wine, as a beverage, has accompanied humans since prehistoric times [16]. Fine wines were a feature of the Symposium in ancient Greece, and as gifts amongst wealthy, high ranking Roman individuals, more than two thousand years ago [17]. These cultural traditions still thrive today, worldwide. Through the centuries, as noted by Sieur de Montaigne in France [18], Juch in Germany (morbo dominorum et domino morborum, namely, disease of lords and lord of diseases) [19], and Porter and Rousseau in England [2][20], gout was as frequent a companion to these fortunate folks as was comedy about their arthritic plight. Even allowing that the main audience for the satires were those who were living with gout, the following questions can be asked: What characteristics made wine fine? What were the special properties of fine wine that predisposed to gout? Why was gout less frequent in the rest of the population?

Throughout the ages, wine was, and continues to be, a common beverage amongst all classes in wine drinking cultures. Ordinary wine was consumed in the same year as grapes were harvested. This wine was fermented for short periods, was low in alcohol and was rough in taste. In ancient times, wine, prized as fine wine, was notable for its smoothness, sweet taste, blood red appearance, and conviviality-promoting (alcoholic) effects [21]. Ordinary wine was commonly stored in clay amphorae, but the finest wine was fermented and then stored in much more expensive wooden casks and barrels. Fermenting wine for longer periods increased the conversion of sugars to alcohol at the cost of decreased sweetness. Storing wine in wood casks for prolonged periods facilitated aromatic compounds present in the wood to diffuse into the wine, enhancing taste and smell [22][23]. Wood casks, used in France for over 2000 years, commonly oak [24], were sealed with pine resin. Resin is the waxy substance beneath the bark [25]. Resin is composed of terpenes and other long chain hydrocarbons that are impermeable to water. Resin has a pleasant smell and taste contributing to the sensory pleasure of wine. To enhance sweetness and smoothness, fine wine was adulterated with *sapa* [17]. Sapa was

unfermented *must* (grape juice with skins, seeds, stems) boiled to a syrup about one third of the original volume, specifically in lead or lead lined vessels. Lead from the pot surface combined with acetate ions in the wine *must* to yield colorless, sweet tasting, lead acetate, $Pb(C_2H_3O_2)_2$, known as “sugar of lead”. Sapa was used to coat the inside of wine casks. Sapa is miscible within the resin. Both sapa and resin are soluble in alcohol, and so the lead concentration in wine increased along with the alcohol concentration and storage time. Lead toxicity has been associated with gout since ancient times [26]. Saturnine gout, acute gout associated with “moonshine”, the drinkable product of Ilicit alcohol distillation and use of lead solder in stills, “continues as atopic of contemporary interest [27]. However, as will be discussed later, caution must be expressed about a blanket association of slightly elevated blood lead level in the general population with increased lead in the environment [28], and the high association of gout within selected segments of a population.

3. Gout, Fine Wine, Heredity Affecting Male British Aristocrats

The cultural associations of aristocrats drinking fine wine and contracting gout have been a popular subject for satire through the centuries. Gout as a humorous condition, self-inflicted by drinking and dietary excess, still remains a popular, but erroneous perception today [29]. This perception is derived from the continuing popularity of 18th century caricatures by Gillray, Rowlandson, Cruikshank and others, depicting an obese Georgian gentleman at a sumptuous banquet with his bandaged foot resting on a “gout stool” [2]. Because this perception is not the present reality of gout, it is worthwhile examining how this perception came to be entrenched in 18th century Britain. The story begins in 1154, when Bordeaux was acquired by England through the marriage of Eleanor of Aquitaine to her cousin, the future King, Henry II. Wine imports of claret, red Bordeaux wine, became the principal source of income for Henry and subsequent British monarchs, the main market being the nobles and other wealthy folks imitating aristocratic cultural habits [30]. This continued until the War of the Spanish Succession in the early 1700s when sanctions increased the duty on imported French wine. By the Treaty of Methuen 1703, the British worked around this economic obstacle by importing a fortified wine from Portugal, “Port” [31]. Port was stronger in alcohol, than claret. Port, often adulterated, sometimes with lead [32], became even more popular than claret amongst British patricians. Good Port was described as “semper sapidum”, (always tasty). Whether the sapidum (pleasant taste) of 18th century quality Port was in part related to sapa remains problematic, as preparation methods were closely-held trade secrets. For the wealthy, drinking fine wine and Port was culturally a part of extravagant feasts which included excessive ingestion of meat, rich in purines [33]. This feasting custom deflected scientific attention about gout pathogenesis from wine to meat, particularly “sweetmeats” which were especially rich in nucleic acids, and to other epigenetic food related factors including fructose-containing soft drinks [34].

Yet, there is much more to the claret and port story. In the 1600s, British prosperity and the scientific revolution brought glassware doped with lead oxide, “crystal”, invented by George Ravenscroft, to enhance “sparkle” by increasing the translucency and refractive index of glass [35], and colorful, smooth, shiny, lead-glazed ceramic plates [36] to beautify fancy dinner tables. We now know that the lead nanoparticles leached from these prestigious, beautiful objects can contribute to the development of gout.

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