Peer reviewed article
Cranberry health chronicles: myths, mazes and marketing

Abstract
This discussion paper questions the influences which initiate the choice of cranberries, both as a prophylaxis and as a treatment for urinary tract infection, in the older community residing in an aged care facility. By reviewing the evidence to date, it is argued that the influences which assist in decision making have not been adequately evaluated or exposed.

The native North American fruit, the cranberry, has attracted the attention of both consumers and health professionals for use in the prevention and treatment of urinary tract infection (UTI). Used either as cranberry juice, or extract in a tablet form, it is increasingly considered by health carers to be a healthy nutritional supplement for older people residing in residential aged care. As this cohort is recognised as being highly susceptible to UTIs, interest in nurse initiated management to counteract the infective process is significant. Typically, a UTI is defined as evidence of bacteriuria (>10^5 colony forming units of a single species per millilitre) in the absence of contamination and in the presence of leukocytes.

Also pertinent to this discussion are the common symptoms associated with UTIs which often vary in the older client, for example the absence of pyrexia burning on micturition, or change to mental state, which is a frequent indicator in the older adult experiencing an infection.

This discussion centres primarily on three issues: firstly, what evidence is available concerning the use of cranberries in the treatment of UTIs in the frail aged cohort; secondly, whether there is pressure on health professionals to prescribe the treatment; and, finally, the question whether it is the cranberry specifically, or a berry component which can also be found in other fruits, which contain a beneficial element. To investigate these elements of the debate, discussion is confined to an analysis of the available evidence.

A review of the literature
Leading on from the three points raised for discussion, there are many papers examining the use of cranberry juice and cranberry tablets both as a prophylactic and as a treatment. A search of the Cumulative Index to Nursing & Allied Health Literature (CINAHL) lists 111 entries on the subject. Health professionals advocating for the use of cranberries point out that the latest Cochrane review noted that there were two well designed randomised controlled trials (RCTs) which indicated the efficacy of the berry, but the reviewers specifically drew attention to the fact that it was not clear if these results could be replicated in the older adult.

As this paper is being written, there are ongoing studies but, as with all the trials to date, it does raise the question as to what constitutes ‘evidence’. There are anomalies in all research methods. Experimental designed RCTs are frequently mooted ‘the gold standard’ and the most objective method, but objectivity is in itself a barrier to the subjectiveness of being human; other factors such as sample size and the drop out rate of the subjects assigned to the experiments are not always explicit in papers.

Further concerns specific to the older adult in residential care regard that it is estimated that 60-90% of Australian aged care residents experience a degree of dementia, which results in issues of compliance, potentially compromising research project results.

Not all systematic reviews, however, are confined exclusively to RCTs; institutes such as Joanna Briggs in South Australia have developed software for the meta synthesis and meta analysis of other research methods. This inclusion recognises the benefit of qualitative inquiry but the philosophy supporting the interpretation is often not clearly articulated; this again influences the findings. Examples of bias are also found in evidence based inquiry which currently dominates discourse on care directives. The setting identified in the protocol inclusion criteria establishes constraints from the outset and the aggregation of data, statistical, qualitative or narrative, to

Dr Sue Brown
RN BHlthSc, MHlthSc, GCert(TT), DN
James Cook University, Cairns, QLD
Member A&NZ Continence Journal Editorial Committee
E-mail sue.brown@jcu.edu.au

Professor R Nay
RN, BA, MLitt, PhD
Latrobe University, Melbourne, VIC
allow generalisation reduces the richness of context for which qualitative research is often designed.

Compounding these issues is the meagre of amount of research concentrated on nursing management of UTIs and the therapeutic use of cranberry products specific to the aged care population. A second search of CINAHL reduced the number of articles as to use of cranberries specific to the older adult to 13 and, of these, the majority did not include cranberries as the main focus of the inquiry. Given the altered presentation of a UTI in the older adult, it can be assumed that the application of standard adult treatment responses may not be replicable in this cohort.

Turning to a search of the worldwide web and using the Google search engine, the search phrase ‘therapeutic effect of cranberries’ elicited a staggering 39,000 hits. While there is no claim or intention by the authors to currently investigate all the sites, a cursory view suggests that the notion of cranberries as an old American ‘folklore remedy’ known to the early settlers and having been passed down by the native Americans, is fundamental to the receptiveness of the community to the remedy. This history is well documented in many peer reviewed journals as well as authoritative herbal references, but it remains unclear whether this is due to constant repetition or evidence from the historical record.

The path from folklore to scientific research

The history of the use of cranberry as an effective urinary antiseptic is more difficult to track. As early as the 19th century it was identified that the berries gave rise to an increase in the known antibacterial agent, hippuric aid, in urine. Three years after the ‘cranberry scare’, Moen published an article noting the efficacious use of cranberry juice as a treatment in clinical trials of a group of his patients experiencing various urinary symptoms.

Over 30 years later, Avorn et al. cited this paper when conducting the first randomised, double-blind, placebo-controlled trial on the use of cranberry juice in the reduction of the frequency of bacteriuria with pyuria, specifically in older women. The context for the inquiry was a multilevel long-term aged care facility, but many residents were ineligible to participate in the study as they were unable to give informed consent, tolerate 300mls of cranberry juice daily or comply with instructions concerning the collection of urine samples. Acknowledging these omissions, Avorn et al. merely concluded that results may justify the use of cranberry juice as having a therapeutic effect on UTIs.

The company funding the study, however, was quick to publicise the results, which subsequently drew much attention from consumers and health providers seeking a palatable and cost effective response to this common infection. This rush by food companies to extol the health-giving attributes of their products was a 1990s phenomena, often supported by single studies such as Avorn et al. and with little consumer evaluation. However, the concept of ‘value adding’ to food products a health attribute is now firmly established in the minds of the average Australian consumer.

Despite health agencies moving to base treatments on best available evidence, the strength of evidence is not always the primary concern of the consumer; this is reflected in the burgeoning complementary and alternative medicine industry. There is often anticipation by consumers that, in the presence of bacteriuria, an antimicrobial response is required, despite scant evidence in some cases to support such treatment. One way to act in response to this ‘felt need’ is by the provision of a tangible alternative in the form of a cranberry tablet but evidence concerning the efficacy of the compressed powder form of cranberries is very slim.

McGuiness et al. noted during their trial that not all cranberry supplements were found to contain one of the active ingredients, proanthocyanidin, and concluded it was not always possible to distinguish those tablets with active ingredients and those without.
as, at that time, it was not a requirement to list this particular ingredient on the label.\(^{15,16}\) Anecdotal evidence suggests the older adult tolerates tablets better than the tart tasting juice and, while the literature suggests 300–400mg daily as a recommended dose, this has not been rigorously evaluated\(^{8,17}\).

The bulk of studies have centred around the optimum intake of cranberry juice; this ranges from a suggested 30mls of concentrate a day to 710mls of commercial (diluted) juice. However, there are variables such as manufacturing strengths of the juices, additional berry mixes, as well as sugar content to be considered\(^{8,11,18-21}\). The most consistently recommended amount for prophylactic treatment of UTIs was 300mls daily but it was unclear as to the concentration of active ingredients.

Once a UTI was diagnosed, however, the volume of intake was not clearly demonstrated\(^{12,22}\). One study noted that frail older clients often could not tolerate large amounts of juice and questioned if timing of ingestion was significant concerning optimum effectiveness, a variable which has attracted little attention from researchers to date\(^{23}\). Further to the debate, issues concerning ingestion of large amounts of fluid to enhance urinary health, by assisting the body to flush out rogue bacteria through volume alone, has not been acknowledged; a further issue is whether it is the cranberry exclusively, or merely a specific berry component, also found in other fruits, that contains the beneficial element.

The hard science behind the cranberry debate emerges from the work of Sabota in 1984\(^{24}\) and Zafriri in 1989\(^{25}\) who demonstrated that cranberry juice or, more specifically, two components of cranberry juice, inhibited\(^{26}\) *Escherichia coli* from attaching to the bladder wall. The active ingredient in cranberries responsible for this action is the natural phenolic called proanthocyanidin which occurs predominantly in red, blue or purple skin of berries\(^{26}\). The strong, red colouring of cranberries denotes greater stability of these phenols and may make them superior to those berry types in the same genus, vaccinium, which includes blueberries, bilberries, bearberry and lingonberry, which vary in colour from bright red to blue. Cranberry hybrids which do not exhibit the strong red pigment may therefore be of little value in this discussion.

Climate also contributes to the vagaries of colour as there is a need for optimum ripening conditions and this, in combination with elevation and cultivation practices such as yield per bush and maturity of fruit, will impact further on subsequent phenolic content, complexity and stability\(^{27}\).

The characteristics of different species of berries may also impact on phenolic content, for example the European species (*Vaccinium oxyccous* and *V. vitis idaea*) differ from the North American species (*V. macrocarpon*). Australian cranberries are mostly of the Epacridaceae variety and there are various hybrid varieties being further developed worldwide. The therapeutic effect of the juice of these different varieties and, in fact, all red berried fruits, has not been clearly identified in literature.

**Discussion**

From the analysis of the literature, a further two key questions arise. Firstly, although *E. coli* is by far the most common organism causing UTIs in the older adult, it is by no means exclusive, so, without accurate diagnosis, the juice may have little value in the presence of other bacteria. Secondly, investigations as to how long the inhibitory process works following the expulsion of urine containing the proanthocyanidins from the bladder has yet to be explored. As early as the 19th century it was known that the juice lowered the pH of urine and, as a consequence, minimised infection but this effect has now been found to be transient\(^{12,28}\). Long-term, longitudinal studies would assist in confirming or refuting if there was a similar transient effect concerning bacterial adherence to the bladder wall.

To those advocating cranberry juice, or their detractors, this discussion has neither supported nor rejected its use. One barrier identified in this cohort is the feasibility of administering the juice to older adults who may not be familiar with the taste and, through altered cognition, be unable to comply with treatment. A further barrier is that the compressed cranberry extract tablets lack the support of rigorous research and, despite their natural profile, are not without contraindications – they may increase urinary oxalate levels, with the potential for formation of kidney stones\(^{17}\). Those clients experiencing irritable bowel syndrome are advised to use the juice with caution and the high sugar content is contraindicated in diabetics, obese patients and those presenting with a fever.

Further, with increasing concerns as to the adverse effects of polypharmacy in the older adult, drug and food interactions have not been clearly demonstrated. However, evidence suggests high doses of vitamin C, a vitamin found in abundance in cranberries, is contraindicated with anticoagulant therapy\(^{29}\).

A further concern is that, while aged care facilities increasingly offer cranberry juice as part of a therapeutic treatment regimen, the cost effectiveness of the intervention has not been assessed. Cranberry juice adds significantly to budget outlay and research into more readily available local, red berry juices containing proanthocyanidins may prove a valuable alternative.
Conclusion

The vital need for alternatives to broad spectrum antibiotic treatment will no doubt fuel increasing inquiry into cranberries, but evidence from such studies will require a degree of professional deliberation. To assume that a systematic review and the subsequent evidence based guidelines should dictate all treatments regimens is profoundly naive from a research perspective. The marketing imperative and subsequent influence of large cranberry production companies need to be considered.

Record cranberry harvests have occurred over the last decade in the United States of America, of which approximately 60% is used for juice extraction; this demonstrates the need to expand and maintain their market base. Until the evidence for using cranberry juice is stronger, it should, at the very least, be used with caution and an awareness of its potential for neutral or even adverse effects brought to attention of all health care workers.

The debate also needs to be considered within the wider context of increasing availability of information concerning treatments for consumers and the escalating complementary and alternative medicine market which remains largely self-regulated to date. Currently, the discipline of medicine firmly holds the key to the door of prescription drugs in Australia, but does this result in some non-prescription drugs gaining traction in the marketplace because they circumvent the gatekeeper? This debate has far wider ramifications for the clients and the health industry than that of the benign adoption of a simple folklore remedy.

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