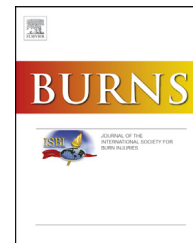


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# Starchy liquid burns do not have worse outcomes in children relative to hot beverage scalds

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## ABSTRACT

**Aim:** To characterise children presenting with hot beverage scalds versus scalds caused by starchy water.

**Methods:** Retrospective survey of prospectively collected database of all children presenting over a two-year period.

**Results:** There were 138 starch scalds and 262 hot beverage injuries. Children with hot beverage injuries were significantly younger (18.2 months; IQR 14.1, 27.8) than those suffering starch scald injuries (51.4 months; 18.7, 102.3;  $p < 0.001$ ). Perineal burns were more common in the starch group than the hot beverage scald group (10.9% vs. 2.4%,  $p < 0.001$ ). Chest/breast and abdominal burns were more common in the hot beverage group than the starch group (60.7% vs. 36.9%,  $p < 0.001$ ). Children under three years of age in both groups are significantly less likely to receive adequate first aid at the scene ( $p < 0.001$ ). There are no differences in the need for skin grafting or scar management when comparing hot beverage scalds and scalds caused by starchy liquids.

**Conclusions:** Scald injuries caused by starchy liquids do not appear to cause a more severe injury than hot beverage scalds. There is a different pattern of injury from starchy liquids in older children. Children under three years old are less likely to receive appropriate first aid at the scene.

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## 1. Introduction

Scalds are the primary cause of paediatric burn, accounting for over half of all burns hospitalisations [1–7]. Most paediatric

burns occur in children under 2 years of age [1,8,9]. Children are at risk of scald burns during the preparation, transfer and/or consumption of hot liquids [1,2,10]. An increasing frequency of scald burns associated with instant noodles has been noted, with burns secondary to instant noodle preparation and

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Abbreviations: PLCBC, Pegg Leditschke Children's Burns Centre; QPBR, Queensland Paediatric Burns Registry.

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consumption linked with significant scald burn morbidity in paediatric populations [2]. Scald burns in younger children are most often sustained while reaching for items above them, or when adults accidentally spill liquids over them, causing injury to the upper limbs and trunk. In older children scald burns can also affect the lower body, spilling from containers into their laps [6,9,11].

Previous investigations have shown pre-packaged noodles and instant soup cups to be a frequent cause of burns, with container design playing a factor in the risk of sustaining a burn [3,11]. Tall cups tapering to a narrow base are prone to tipping over and spilling their contents, contributing to risk in up to 28% of these scalds in children [3]. Inconsistency of warning labels, as well as the insulating effects of polystyrene instant noodle packaging, may also play a role [3,11]. With increasing concern around hot noodle/soup and burns to children, recommendations have been made to increase parental supervision when using instant noodle preparations, as well as regulating manufacturers in regards to proper safety information about product preparation and consumption [3].

Starch is a complex carbohydrate composed of glucose units joined by glycosidic bonds  $(C_6H_{10}O_5)_x$ . It is the chief storage form of energy in plants, and the most common carbohydrate in human diets. Some starch is released into water; depending on exposed surface area, temperature, and time. In industry this property forms the basis for starch extraction, with the resultant 'starch milk' then being dewatered and dried, so starch can be used (among other things) as the basis for adhesives.

The Pegg Leditschke Children's Burns Centre (PLCBC) is the major children's inpatient and outpatient burns centre for Queensland and northern New South Wales in Australia, treating approximately 750 new patients annually. Scald injuries represent the most common mechanism seen [6]. There was a perception among the senior staff that injuries caused by starchy liquids such as pot noodles, potato or rice water were more severe than hot beverage scalds. We wondered if solutes in water might alter the nature of a resulting scald. With starches this may be due to the pasting or adhesive properties of starchy liquids increasing burn time. We had become more guarded in our early prognosis of such patients with their parents; more so than was the case with hot beverage scalds. If our perception were true, this represented an important area for future research into contributing mechanisms. If untrue, then we were distressing families unnecessarily with pessimistic prognoses early on in their treatment. In stressful and painful situations, children look to their parents for cues. Parental coping strategies may predict how children react in these situations, so anything that can decrease parental stress is likely to also have beneficial effects on the child [12,13].

## 2. Aim

The aim of this study was to compare outcomes in scalds caused by hot beverages, and those caused by starchy liquids, in a paediatric population. If outcomes were different we aimed to determine if circumstances surrounding the burn (such as first aid provision) might explain these differences.

## 3. Methods

The Queensland Paediatric Burns Registry (QPBR) began data collection on January 1st 2013. It is a prospective database detailing new burns presenting to the PLCBC. Informed consent is obtained from parents or guardians for inclusion of children in the database, and for subsequent research arising from the data. A detailed pro forma is completed at presentation for all new patients. It includes the following information

- Demographic data
- Events leading up to and surrounding the burn
- First aid given, both at the scene and in hospital
- Depth and body surface area of burns.

This database can be matched to hospital records detailing dressings, healing times, grafting, and scar management.

Children with a scald injury between 1 January 2013 and 31 December 2014 were identified from the database. These children were further subdivided into two groups—hot beverage scalds, and scalds caused by starchy liquids. Hot beverage scalds are cups of tea or coffee, which may contain milk and/or sugar. Starchy liquids were defined as the broth resulting during boiling cereals, tubers, root vegetables, or processed starchy foods such as noodles or pasta. In practice this group is made up predominantly of children scalded by potato, rice or pasta cooking water; children scalded by vegetable soups, and children scalded by instant noodle preparations. These are dropdown fields within our database. There is also a free text field to allow expansion on the mechanism.

Depth of injury was assessed at each clinic review by one of five consultant paediatric burns surgeons. The PLCBC uses the Shakespeare classification for burn depth [14]. Burns are classified as

- Superficial
- Superficial partial thickness
- Deep partial thickness
- Full thickness

In general, children with outpatient burns are reviewed once or twice weekly, depending on the dressings used. Two main dressings are used—Mepitel<sup>®</sup> (Mölnlycke, Frenchs Forest, NSW, Australia) and Acticoat<sup>™</sup> (Smith & Nephew, Hull, United Kingdom), or Mepilex<sup>®</sup> Ag (Mölnlycke, Frenchs Forest, NSW, Australia) [15]. The surgeon assessing the wound determines time to next dressing change.

Statistical analyses were performed using SPSS version 22 (IBM Corporation, Armonk, NY, USA). Due to the non-normal age distribution, data are presented as medians and inter-quartile ranges (IQR). Mann Whitney U tests, Crosstabs Chi square (or Fisher's exact test where appropriate) were used to compare differences between groups. A *p*-value of <0.05 was considered significant.

Ethics approval was obtained prior to commencing this study from the Children's Health Services Human Research Ethics Committee (HREC/14/QRCH/023).

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