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| Question | |
| **Should oral rehydration salts vs. milk be used for avulsed human teeth?** | |
| **Population:** | Avulsed permanent human teeth |
| **Intervention:** | Storage in oral rehydration salts (ORS) |
| **Comparison:** | Storage in cow’s milk (unspecified or whole milk) |
| **Main outcomes:** | Tooth viability, as measured by cell viability after 45 to 90 minutes immersion (immersion after 30 or 60 min drying) |
| **Setting:** | Clinical and laboratory in relation to prehospital management |
| **Perspective:** | First aid |
| **Background:** | While it is recognized that immediate replantation of an avulsed permanent tooth provides the best opportunity for tooth survival, this may not be possible in the first aid setting. This review evaluates means of temporarily storing an avulsed tooth until the tooth can be replanted. |
| **Conflict of interests:** | None declared |

# Assessment

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| Problem Is the problem a priority? | | |
| Judgement | Research evidence | Additional considerations |
| ○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know | The oral region comprises 1% of the total body area, yet it accounts for 5% of all bodily injuries. In preschool children, oral injuries are estimated at 17% of all bodily injuries. The incidence of traumatic dental injuries estimated at 1%-3%. Prevalence is steady at 20%-30% (Anderson 2013 S2).  Several groups investigating injury rates across non–mouthguard mandated sports (e.g., baseball, basketball, soccer) estimated that orofacial injury rates ranged from 3%-38% of all sport-specific injuries (Kvittem 1998 288; Kumamoto 2004 270).  During the last decade traumatic dental injuries were recognized as a public dental health problem worldwide (Zaleckiene 2014 7). |  |
| Desirable Effects How substantial are the desirable anticipated effects? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Trivial ○ Small ● Moderate ○ Large ○ Varies ○ Don't know | For the critical outcome of viability (number of viable PDL cells) we have identified very-low-certainty evidence (downgraded for risk of bias, indirectness and imprecision) from 2 randomized studies (Rajendran 2011 217; Subramaniam 2015 62) including 100 extracted teeth, showing benefit from 45 to 90 min immersion in ORS when compared with milk (unspecified) or whole milk (SMD, 4.16; 95% CI, 2.10–6.23; P<0.0001).   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Certainty assessment** | | | | | | | **№ of patients** | | **Effect** | | **Certainty** | **Importance** | | **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** | **ORS** | **milk** | **Relative (95% CI)** | **Absolute (95% CI)** | | **Cell viability after 45 to 90 minutes immersion (immersion after 30 or 60 min drying) (Rajendran 2011 and Subramaniam 2015)** | | | | | | | | | | | | | | 2 | randomised trials | serious a,b,c,d | not serious | serious e,f | serious g | none | 50 | 50 | - | SMD **4.16 SD higher** (2.1 higher to 6.23 higher) | ⨁◯◯◯ VERY LOW | CRITICAL | | Treatment of dental and oral injuries can cost upwards of 15,000$ over an individual’s lifetime.  Important public health implications such as how to best – organize emergency dental care and how to prevent dental injuries, decrease cost, and increase lay knowledge are important factors needed to change epidemiologic data toward more favorable figures in the future (Gould 2016 821). |
| Undesirable Effects How substantial are the undesirable anticipated effects? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Large ○ Moderate ○ Small ○ Trivial ○ Varies ● Don't know | The studies did not report undesirable effects. |  |
| Certainty of evidence What is the overall certainty of the evidence of effects? | | |
| Judgement | Research evidence | Additional considerations |
| ● Very low ○ Low ○ Moderate ○ High ○ No included studies | There are limitations in study design, indirectness and imprecision. |  |
| Values Is there important uncertainty about or variability in how much people value the main outcomes? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Important uncertainty or variability ○ Possibly important uncertainty or variability ● Probably no important uncertainty or variability ○ No important uncertainty or variability | No research evidence identified. | Developed countries may place more value on personal hygiene and personal appearance, thus, the ability to save a tooth in developed countries is likely more desirable. |
| Balance of effects Does the balance between desirable and undesirable effects favor the intervention or the comparison? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Favors the comparison ○ Probably favors the comparison ○ Does not favor either the intervention or the comparison ● Probably favors the intervention ○ Favors the intervention ○ Varies ○ Don't know | The evidence shows benefit for cell viability after 45 to 90 min immersion in ORS. No undesirable effects were reported. |  |
| Resources required How large are the resource requirements (costs)? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Large costs ○ Moderate costs ● Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know | No research evidence identified. | In developed countries, much of the cost of saving a tooth can be outweighed by the overall cost needed to replace a tooth. However, the cost of commercial devices could be a challenge for many developing countries. |
| Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Very low ○ Low ○ Moderate ○ High ● No included studies | There were no studies identified on resource requirements. |  |
| Cost effectiveness Does the cost-effectiveness of the intervention favor the intervention or the comparison? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Favors the comparison ○ Probably favors the comparison ○ Does not favor either the intervention or the comparison ● Probably favors the intervention ○ Favors the intervention ○ Varies ○ No included studies | No research evidence identified. | The cost of ORS is negligible in most countries. |
| Equity What would be the impact on health equity? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Reduced ○ Probably reduced ● Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know | No research evidence identified. | ORS is available worldwide and thus no impact on health equity would be anticipated. |
| Acceptability Is the intervention acceptable to key stakeholders? | | |
| Judgement | Research evidence | Additional considerations |
| ○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know | No research evidence identified. | Would likely be acceptable for individuals with an avulsed tooth if it will allow a tooth to survive prior to successful replantation. |
| Feasibility Is the intervention feasible to implement? | | |
| Judgement | Research evidence | Additional considerations |
| ○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know | No research evidence identified. | From a practical perspective it is simple to store a sachet of ORS in a first aid kit that could be made into solution for storage of an avulsed tooth, using the victim’s water bottle for example as the container. |

# References

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# Summary of judgements

|  | **Judgement** | | | | | | |
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| **Problem** | No | Probably no | **Probably yes** | Yes |  | Varies | Don't know |
| **Desirable Effects** | Trivial | Small | **Moderate** | Large |  | Varies | Don't know |
| **Undesirable Effects** | Large | **Moderate** | Small | Trivial |  | Varies | Don't know |
| **Certainty of evidence** | **Very low** | Low | Moderate | High |  |  | No included studies |
| **Values** | Important uncertainty or variability | Possibly important uncertainty or variability | **Probably no important uncertainty or variability** | No important uncertainty or variability |  |  |  |
| **Balance of effects** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | **Probably favors the intervention** | Favors the intervention | Varies | Don't know |
| **Resources required** | Large costs | Moderate costs | **Negligible costs and savings** | Moderate savings | Large savings | Varies | Don't know |
| **Certainty of evidence of required resources** | Very low | Low | Moderate | High |  |  | **No included studies** |
| **Cost effectiveness** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | **Probably favors the intervention** | Favors the intervention | Varies | No included studies |
| **Equity** | Reduced | Probably reduced | **Probably no impact** | Probably increased | Increased | Varies | Don't know |
| **Acceptability** | No | Probably no | **Probably yes** | Yes |  | Varies | Don't know |
| **Feasibility** | No | Probably no | **Probably yes** | Yes |  | Varies | Don't know |

# Type of recommendation

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| Strong recommendation against the intervention | Conditional recommendation against the intervention | Conditional recommendation for either the intervention or the comparison | **Conditional recommendation for the intervention** | Strong recommendation for the intervention |
| ○ | ○ | ○ | **●** | ○ |

# Conclusions

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| Recommendation |
| We suggest the use of oral rehydration salts compared with cow’s milk as a temporary storage solution for an avulsed permanent tooth that cannot be replanted immediately. |
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| Justification |
| Oral rehydration salts are provided in small packets that are inexpensive, easily carried and can be dissolved with water when needed as a storage solution. Cow’s milk, the comparison, is not as easily transported and may require refrigeration. |

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| Subgroup considerations |
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| Implementation considerations |
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| Monitoring and evaluation |
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| Research priorities |
| Research from the clinical setting is needed to confirm findings detailed in the included studies. |