

## Early Maternal Breast Milk for Preterm Babies: Context and Objectives

Maternal Breast Milk for preterm babies is an exceptional example of both personalised and precision medicine

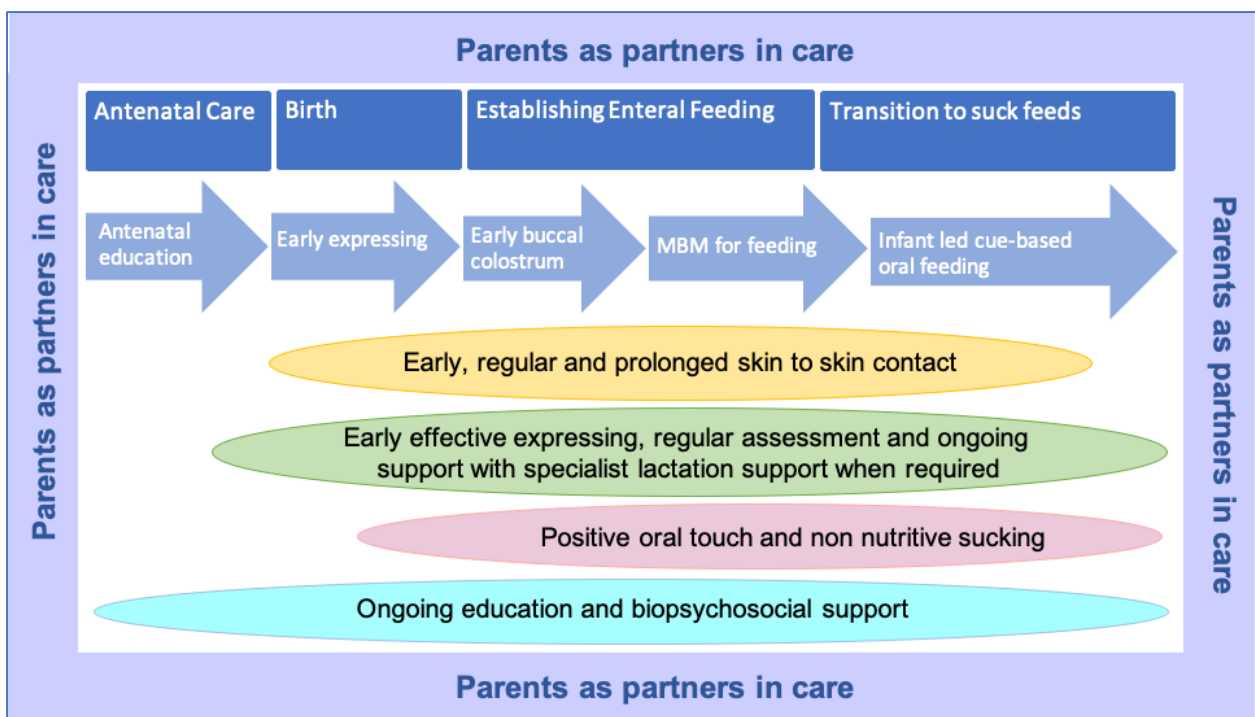
### Context

The central focus of this toolkit is babies born at less than 34 weeks gestation, although the contents may also support improved Maternal Breast Milk (MBM) provision for all babies in the first days of life (including later preterm and sick term babies). Establishing and sustaining lactation and transitioning to responsive feeding will be the focus of a subsequent toolkit.

Whilst guidance for safe storage and handling of MBM is vitally important, this is outwith the scope of this QI toolkit (see British Dietetic Association [handling breast milk guideline](#)<sup>11</sup>)

Initiating, maintaining and supporting longevity of MBM provision for preterm babies is vital, with substantial longterm benefits. The holistic, multidisciplinary and family-centred approach to this cannot be over emphasised, which continues well beyond the perinatal period (Figure 2).

Figure 2. An overview of the MBM journey for preterm babies and their families



### Organisational Drivers

1. [National Neonatal Audit Programme](#) (NNAP)<sup>1</sup>: Since 2013 the NNAP has reported on the proportion of babies with gestation at birth less than 33 weeks who are receiving any MBM at discharge home<sup>1</sup>. In 2018, 59.6% (3,652 of 6,128 eligible babies) were receiving MBM, either

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exclusively or with another form of feeding, at the time of their discharge from neonatal care. The range for regional Operational Delivery Networks (ODNs) varied between 45% and 82%. There has been no sustained improvement in this measure nationally in the last 5 years (60.5% in 2017; 59% in 2016; 58% in 2015)<sup>1</sup>.

In 2020 the NNAP is introducing a new measure of MBM feeding at 14 days of life for babies born at less than 32 weeks gestation, emphasising the importance of early MBM and the impact of early action on maternal supply for the optimisation of long-term breastfeeding outcomes.

2. [Maternity & Neonatal Safety Improvement Programme](#) (MatNeoSIP)<sup>2</sup>: Optimisation and stabilisation of the very preterm infant is one of the three drivers of this national improvement programme. Strategies to optimise MBM are key elements of this work, including a focus on ensuring that *“all women in threatened preterm labour are informed of the increased benefits of breast milk and breastfeeding for preterm infants”,* and that *“appropriate information and equipment is available prior to delivery to support timely expressing within four hours of delivery for women who choose to provide MBM for their infants.”*
3. [Scottish Patient Safety Programme – Maternity and Children Quality Improvement Collaborative](#) (SPSP MCQIC)<sup>3</sup>: The five-year plan for maternity and neonatal care includes the recommendation that *“Parents should be involved in decision-making throughout and involved in practical aspects of care as much as possible. This includes the provision of facilities for overnight accommodation, encouraging kangaroo skin-to-skin care and early support for breastfeeding”*
4. [UNICEF Baby Friendly Initiative](#) (BFI)<sup>12</sup>: The Department of Health, England, has asked all maternity units in the country to deliver an accredited, [evidence-based infant feeding programme](#) such as the UNICEF BFI<sup>13</sup>. Units across the devolved nations will also be following this initiative to support their infant feeding work.
5. The Welsh government has committed to ensuring that ‘breastfeeding is a core component of training’ in the [All Wales Breastfeeding Five Year Action Plan](#)<sup>14</sup>.
6. The Scottish Government [“Becoming Breastfeeding Friendly”](#) report calls for evidence based training to enable families to have equitable access to effective infant feeding support<sup>15</sup>.
7. The National Institute of Health and Care Excellence (NICE) has defined UNICEF BFI accreditation as a universal minimum standard<sup>16</sup>. Historically neonatal units gained BFI accreditation through their associated maternity unit but since 2015 it is possible to gain specific neonatal accreditation, which is being pursued by units of all levels across the country.
8. [Bliss Baby Charter](#)<sup>17</sup> has also been recognised by the Scottish Government and in the Neonatal Critical Care Review in England as driving improvements in parental involvement in their baby's care. The Charter has a specific principle relating to MBM feeding support.

Both the Bliss Baby Charter and the BFI have been recommended by the NNAP as important tools to drive improvement in breastfeeding rates and this toolkit should be used as a **complementary resource** to these wider initiatives, supporting units on their improvement journey.

## Early Maternal Breast Milk for Preterm Babies: Rationale

Mothers of vulnerable infants, such as extremely premature infants, encounter a variety of unique breastfeeding barriers and challenges. Despite the known benefits of maximising MBM for very preterm babies, a large proportion of preterm babies in the UK are not fed an exclusive breast milk diet. Breastfeeding for mothers of preterm babies depends on a complex system of multidisciplinary and holistic interventions which focus on individual, structural, cultural and environmental factors. Table 2 describes **10 core elements** that support the optimisation of early MBM supply and transition to breastfeeding for preterm babies.

The objective of this toolkit is to deliver the **five perinatal elements**, colour coded as themes throughout the toolkit. A future toolkit will focus on the second five elements.

**Table 1. 10 core elements that support the optimisation of MBM supply and breastfeeding for preterm babies from before birth to discharge from the neonatal unit**

Core elements that support the optimisation of early MBM	
<b>1</b>	<b>Parents as equal partners in their baby's care:</b> Parents are empowered to take part in all elements of their baby's care, facilitating strong close and loving attachments
<b>2</b>	<b>Antenatal education:</b> Educating families about the value of MBM in prematurity, importance and process of early expressing
<b>3</b>	<b>Initiation of expressing soon after birth (aim within 2 hours):</b> With easy access to support, training and equipment
<b>4</b>	<b>Early Colostrum (ideally within 6 hours of birth and always within 24 hours):</b> MBM to be the first enteral feed given to baby
<b>5</b>	<b>Early and regular parental physical contact with their baby:</b> Delivery room contact, skin-to-skin early and often
<b>6</b>	<b>Positive oral touch and non-nutritive sucking</b>
<b>7</b>	<b>Establishing a good milk supply:</b> Regular expressing assessments and an understanding of optimal expressing
<b>8</b>	<b>Responding to challenges around lactation and breastfeeding:</b> Recognition of complex situations, specialist lactation support available
<b>9</b>	<b>An infant led approach to the transition to responsive feeding:</b> Recognition of feeding cues and a structured approach
<b>10</b>	<b>Successful breastfeeding after discharge:</b> Supporting parental confidence and knowledge

### Rationale: evidence supporting benefits of maternal breast milk

MBM is the optimal form of feeding for preterm infants. Specific health benefits for the preterm infant population include lower mortality rates, lower rates of sepsis and necrotising enterocolitis (NEC)<sup>18,19</sup>, improved neurodevelopmental outcomes<sup>20</sup>, lower rates of bronchopulmonary dysplasia (BPD)<sup>21</sup>, retinopathy of prematurity (ROP)<sup>22</sup> and fewer hospitalizations in the first year after discharge compared to formula feeding<sup>23</sup>. The WHO<sup>24</sup> and specialty consensus guidelines across multiple areas of neonatology<sup>25-27</sup> recommend maximising the use of MBM for premature and sick babies. Figure 3 provides

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a visual summary of key evidence on the positive impact of MBM. This could be used for education and motivation of staff and patients.

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**Figure 3. The impact of MBM on preterm babies**

MBM maternal breast milk; VLBW very low birth weight; ELBW extremely low birth weight; NEC necrotising enterocolitis<sup>18–23,28–32</sup>



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#### Notes:

**Donor human milk**, when compared to formula usage in situations where no MBM is available, is also associated with reduced NEC rates<sup>33</sup> and can be better tolerated than formula milk<sup>34</sup>. Where it is used in conjunction with effective lactation support, the use of donor milk may possibly increase MBM provision<sup>35</sup>. The evidence for the use of donor human milk as a supplement where MBM is available, but not in sufficient volumes is less clear, and this is an important area for research. Therefore, whilst donor milk does not have all the benefits of MBM it should be considered for the smallest preterm babies where MBM is not available<sup>36</sup>.

**Contraindications to MBM:** There are very few situations in which MBM would be contraindicated for a preterm baby (outside of situations where all enteral intake is contraindicated, and in many of these situations buccal colostrum may still be given safely). These include maternal HTLV lymphoma, infant classical galactosaemia, congenital lactose intolerance and maternal HIV (although guidance in HIV is more nuanced than in the past and MBM can be used if desired in certain circumstances – see most up to date [BHIVA guidance](#)<sup>37</sup>). NICE<sup>16</sup> recommends that maternal medication suitability in lactation should be checked with specialist sources, such as the UK Drugs in Lactation Service [UKDILAS](#)<sup>38</sup> (an NHS specialist formulary freely searchable online), rather than the British National Formulary (BNF).

**Parental mental health and wellbeing:** The provision of MBM has a direct impact upon maternal physical and mental health which can be both positive and negative. Immediately after preterm birth mothers may feel traumatised, frightened, exhausted, unwell and isolated from family support systems. At this time, broaching the urgency and frequency of expressing can be challenging to do in an empowering and encouraging way. Expressing is a learned skill, which might feel overwhelming at a time of high anxiety for their baby's health. Mothers can experience lactation support as imposing pressure to express, which competes with other demands upon them including the time to recover from the psychological and physical demands of preterm birth. At worst, this may lead to feelings of intimidation, exacerbation of guilt and inadequacy, disconnection from their baby and an increase in anxiety, depression and even post-traumatic stress reactions.

Improving MBM outcomes must be done in a way which instead helps parents to feel empowered, supports them to value the unique contribution of their milk and maximises their success, improving their connection to their baby and improving their mental health. Parent representation to this working group has emphasised how it is vital, during perinatal and neonatal care, to acknowledge **“the importance [of MBM] for empowering women rather than expressing being another source of trauma and distress”**.

*Genevieve Howell, parent of a preterm baby.*

#### **Rationale: evidence supporting strategies to increase maternal breast milk**

The first key step to the establishment of a good maternal milk supply lies in the perinatal period. The volumes of milk mothers can express as early as day 3 or 4 of life are highly correlated with long term breastfeeding outcomes<sup>39–41</sup>, supporting the idea that this early period is a critical window.

There are a number of strategies to increase early MBM delivery to very preterm babies with the evidence base ranging from moderate quality to best practice, including consensus expert opinion. A summary of the most relevant or useful evidence can be found below for each of the 'Five Perinatal Core Elements'. You will be guided through the exploration of these contextual factors in subsequent sections, and may



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find it useful, as a perinatal team, to work through the interventions, QI techniques and change ideas for each of the elements.

**1. Parents as equal partners in their baby's care: Parents are empowered to take part in all elements of their baby's care, facilitating strong close and loving attachments**

Family-centred and family-integrated care starts in the perinatal period to ensure that parents are central to their baby's care even when the baby is unwell<sup>13,17</sup>. Whilst there is limited evidence linking the use of FIC with provision of early MBM, there are many studies showing a positive effect of family integrated care (FIC) and parental involvement on breastfeeding at discharge.

Evidence	Reference source
FIC increased any breastfeeding at discharge from 46% to 82% (pilot RCT)	O'Brien 2013 <sup>42</sup>
FIC increased "high frequency breastfeeding" (≥6 times a day) at hospital discharge from 63% to 70% (cluster RCT)	O'Brien 2018 <sup>43</sup>
Policies promoting early involvement of parents in feeding support were associated with increased MBM feeding at discharge for moderately preterm babies, with an adjusted odds ratio (OR) of 1.9 (multicentre cohort study)	Mitha 2019 <sup>44</sup>

**2. Antenatal education: Educating families about the value of MBM in prematurity, importance and process of early expressing**

This includes both a broad level of education of mothers identified early in pregnancy at increased risk of preterm birth and more targeted 'time-critical' education for families where preterm birth is imminent. Lactation-specific antenatal counselling should cover the specific benefit of MBM for the preterm baby; the vital importance of starting to express as soon as possible after birth; realistic volumes of colostrum expected; and familiarisation with the techniques and equipment involved.

Evidence	Reference source
Lactation-specific antenatal counselling was associated with increased exclusive breastfeeding at discharge (65% vs 24%) and length of full breastfeeding after discharge to a mean 60d vs 21d (case-control study)	Friedman 2004 <sup>45</sup>
85% of mothers who had planned to formula feed initiated breast milk expression after lactation specific counselling, with no change in level of anxiety. All were glad that staff helped them with expression (cohort study)	Sisk 2006 <sup>46</sup>
All mothers who had planned to formula feed reported no feeling of pressure, coercion or guilt after lactation specific counselling. All identified positive consequences of expressing (qualitative study)	Miracle 2004 <sup>47</sup>

**Antenatal Expressing**

Where preterm birth is **inevitable** (for example, a mother is awaiting a planned caesarean section; or where spontaneous preterm labour is established and birth is inevitable within the next hour or two), some units take the pragmatic approach to support mothers to express just before the birth occurs, in

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parallel with other preparations. There is no evidence on the safety or benefit of antenatal expressing either in this setting or more widely where preterm birth is threatened but not inevitable.

**3. Initiation of expressing soon after birth (aim within 2 hours): With easy access to support, training and equipment**

Expressing soon after birth requires a multidisciplinary collaborative approach between the midwifery staff, obstetricians and neonatal staff to provide sensitive support and education to the mother at this key time.. When a preterm birth is expected, perinatal team discussions should cover key optimisation interventions. Discussing MBM and early expressing should be a central part of this planning. Similarly, after birth, it is vital that all staff members involved with the mother’s care prioritise support for early expressing alongside other elements of postpartum care. For many parents, the first hours after birth will be extremely difficult if their baby has been born very sick - particularly if they haven’t been able to see their baby at this point. It’s also important to note that many women will be very ill themselves, requiring this element of postnatal care to be handled with extra sensitivity. Many women who are ill themselves wish to initiate expressing and illness alone should not preclude conversations taking place and support for expressing being given.

<b>Evidence on initiation of expressing</b>	<b>Reference source</b>
Expressing within 1h of birth (compared to 1-6h) increased expressed milk yield from 267ml/d to 613ml/d at week three of life (pilot RCT)	Parker 2012 <sup>48</sup>
Expressing 1-3h after birth (compared to 3-6h) increased any breastfeeding at discharge from 35% to 62% (RCT)	Parker 2017 <sup>49</sup>
Adjusted odds ratio of exclusive formula feeding at discharge was 1.06 for each hour of delay to first expression (cohort study)	Maruyama 2016 <sup>50</sup>
Policies promoting initiation of expression within 6h of birth were associated with increased MBM feeding at discharge for very preterm babies, with an adjusted OR 2.2 (multicentre cohort study)	Mitha 2019 <sup>51</sup>

There is also evidence related to how to maximise the efficiency of expressing from the first attempt onwards<sup>52</sup>. Frequent and simultaneous pump expression as well as techniques such as massage, warmth and relaxation give mothers the best chance to establish a good milk supply. Ensuring that parents have a realistic understanding of likely colostrum volumes in the post-partum period will prevent distress and discouragement. The mother may not get any drops of colostrum from the first early attempt, but the process of attempting to express will provide valuable stimulation to the breast tissue and hormone pathways to initiate her milk supply.

<b>Evidence on maximising the efficiency of expressing</b>		<b>Reference source</b>
Electric pumps	Double electric pumping from birth yielded a higher volume of milk up to d7 of life than hand expressing (mean 17ml/d compared to 3ml/d on day 1 (RCT) No difference in volumes expressed or longterm breastfeeding outcomes between type or brand of pump (Cochrane review)	Lussier 2015 <sup>53</sup>  Becker 2016 <sup>52</sup>



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	Novel electric pump suction pattern (Medela Preemie+) used for first days of baby's life (until yield of 20ml/session achieved, then switched to standard suction patterns) showed increased volume of milk (200ml/d) from d6 of life onwards, compared to standard suction pattern (RCT)	Meier 2012 <sup>54</sup>
Simultaneous expression (both breasts at the same time)	Simultaneous expression reduced time spent expressing compared to sequential expressing (8 h/week vs 11 h/week; RCT)	Groh-Wargo 1995 <sup>55</sup>
	Simultaneous expression increased milk volume compared to sequential expression (88g/session vs 51g/session; RCT)	Jones 2001 <sup>56</sup>
Expressing frequency	<i>No studies have looked at the expert consensus opinion recommendation of 8-10 times per day</i> 86% of mothers who expressed $\geq 5$ times/d achieved target yield (defined as 500ml/d by d14), vs 22% of mothers who expressed $< 5$ times/d (cohort study)	Hoban 2018 <sup>57</sup>
	Expressing $\geq 7$ times/d was associated with higher yield at 2wks vs $< 7$ times/d (median 622ml/d vs 402ml/d; cohort study)	Morton 2009 <sup>58</sup>
Early volume target	The 24h yield on d7 that maximises sensitivity and specificity to predict long term adequate milk supply is 407ml (cohort study)	Ru 2020 <sup>59</sup>
	Odds ratio for formula feeding at discharge were 7.1 when d4 milk yield was $< 153$ ml/d (cohort study)	Murase 2014 <sup>40</sup>
Breast massage and warmth	Breast massage prior to expressing increased volume expressed (125g/session vs 88g/session; RCT)	Jones 2001 <sup>56</sup>
	Warming the breast with a microwaveable compress for 20 mins prior to expressing increased volume expressed (45ml/session vs 32ml/session; RCT)	Yigit 2012 <sup>60</sup>
Maternal relaxation	Listening to a relaxation-visualisation soundtrack plus/minus looking at photos of their infant during expressing increased yield of expressed milk from d2 of the intervention (on d2, the two intervention groups had yield of 66ml/d and 80ml/day vs control group yield of 35ml/d; RCT)	Keith 2012 <sup>61</sup>

**4. Early Colostrum (ideally within 6 hours of birth and always within 24 hours): MBM to be the first enteral feed given to baby, whenever possible**

The provision of early colostrum to a baby is dependent on getting expressed colostrum to the neonatal unit and administered to the baby. It is reliant on all staff understanding the importance and urgency of early colostrum and the enablers and barriers throughout the service that may affect this process. Based on the available evidence below, neonatal teams should value and prioritise colostrum to be given early as the first feed.

Evidence	Reference source
Buccal colostrum reduced time to full enteral feeds (11.1d vs 15.5d), O2 therapy (12d vs 19d) and ventilator associated pneumonia (3% vs 11%)(RCT)	Abd-Elgawad 2020 <sup>62</sup>

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Buccal colostrum group showed a trend towards a lower risk of developing NEC (4.7% vs 7.7%). Pooled result not statistically significant (p = 0.08, RR = 0.59, 95% CI = 0.33–1.06). Included studies aimed to start colostrum in the first 24h, 48h or 96h (meta-analysis)	Tao 2020 <sup>63</sup>
Buccal colostrum reduced ventilator associated pneumonia (OR 0.39), time to full enteral feed (mean difference -2.7d) and NEC (OR 0.51). Included studies aimed to start colostrum in the first 24h, 48h or 96h (meta-analysis)	Ma 2020 <sup>64</sup>
Buccal colostrum is safe and associated with receiving breast milk as the majority of enteral feeds at 6wks of age and at discharge. Median age at first colostrum was 24h (interquartile range 12-43h; cohort study)	Snyder 2017 <sup>65</sup>
Buccal colostrum inhibited secretion of proinflammatory cytokines and increased urinary/saliva levels of immune-protective factors and reduced sepsis (50% vs 92%). Protocol was to start colostrum at 48h of age (RCT)	Lee 2015 <sup>66</sup>

## 5. Early and regular parental physical contact with their baby

This intervention is based on the prioritisation of physical contact from the earliest time point after birth onwards, whilst maintaining optimal respiratory and thermal support. Training to ensure staff confidence and skills in maintaining baby safety and stability in the transfer to skin-to-skin care (SSC) is essential.

### Delivery Room Contact

The toolkit group recognise that some units, both within the UK<sup>67,68</sup> and internationally<sup>69</sup> are facilitating parent-baby SSC in the delivery room/labour ward prior to transfer to the neonatal unit. Data from these teams seem to reflect this practice can be positive for families, and, based on limited data, can be implemented in these units safely. This practice, if offered, should be done so with multidisciplinary team engagement, planning, training, and structured standard operating procedures regarding safety, equipment, human factors and parental information. Where SSC is not offered, parents should be encouraged to touch their baby in the delivery room.

Evidence	Reference source
Volumes expressed immediately after SSC are higher than expressing in a room away from baby (adjusted mean of 118ml/session compared to 87ml/session) (cohort study)	Acuna-Muga 2014 <sup>70</sup>
The number of times the baby is put to the breast without feeding (licking/nuzzling) is predictive of milk weight in the first 10d (observational data reported as part of RCT)	Fewtrell 2016 <sup>71</sup>
SSC increases exclusive breastfeeding at discharge or 40 to 41w (RR 1.16) and at 1-3mo follow-up (RR 1.20) (Cochrane review)	Conde-Agudelo 2016 <sup>72</sup>
Policies promoting kangaroo care were associated with increased MBM feeding at discharge for very preterm babies (adjusted OR 2.3) and moderately preterm babies (adjusted OR 2.0) (multicentre cohort study)	Mitha 2019 <sup>44,51</sup>
60mins of SSC in the delivery suite increased exclusive breastfeeding at discharge from 69% to 86% (non significant trend; study underpowered). Note, infants had received “less invasive surfactant administration” if appropriate before SSC, had intravenous dextrose running and SSC was performed in a room with ambient temperature of 24°C	Mehler 2019 <sup>69</sup>

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