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Simply Walking into Mordor: How Much *Lembas* Would the Fellowship Have Needed?

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Abstract

The Fellowship of the Ring were supposed to travel from Imraldis to the forges of Mt. Doom in order to destroy the One Ring of Sauron. For an ideal journey with all 9 members of the fellowship, using the metabolic rates for each species from [2], the total calorific consumption of the 92-day journey was found to be 1,780,214.59 kcal. If the elves of Imraldis had provided the Fellowship with *lembas*, this would equate to them having to carry a total of 675 pieces, or 75 pieces each. For the different species, this equates to 304 for the hobbits, 214 for Gandalf, Aragorn and Boromir; 99 for Gimli and 60 for Legolas.

Introduction

The One Ring is one of the darkest and most powerful artefacts in Middle Earth. It was created in the fires of Mount Doom by the dark lord Sauron in an attempt to gain control over the other 19 Rings of Power and thus, rule over all of Middle Earth [1]. Sauron concentrated part of himself into the ring such that defeating him requires that the One Ring be cast into the fires from whence it was forged. This was a task set to a hobbit and his eight companions.

The fellowship consisted of four hobbits (Peregrin Took, Meriadoc Brandybuck, Frodo Baggins and Samwise Gamgee), the Dúnedain ranger Aragorn, Boromir of the race of men, the Istari Gandalf, dwarf Gimli and the elf Legolas Greenleaf. During their travels, the fellowship were given *Lembas* (Waybread) at Lothlórien, an elvish bread preserved in a leaf wrap. *Lembas* was said to 'keep a traveller on his feet for a day of long labour' [1].

In a previous paper [2], the basal metabolic rates (BMR) for the different species in Middle Earth were modelled using animal analogues (foxes for humans, deer for elves and possums for hobbits). The daily calorie consumptions were, for 34-year-old males of each species with average heights and weights:

Hobbits: 1818.61 kcal/day
Men: 1702.2 kcal/day
Elves: 1416.95 kcal/day

This paper explores how much *lembas* would be needed to sustain the fellowship as they journeyed to Mt. Doom if it had been provided at Imraldis. Calculations assume that the members of the fellowship did not become corrupted by the Ring, remaining together for the entire journey.

Concerning Metabolic Activity

To determine the minimum number of *lembas* required, the number of calories consumed on the journey were first calculated. An ideal journey of the fellowship considers the group travelling along Frodo's path beyond Imraldis without encountering the skirmish near Parth Galen between the Fellowship and the Uruk-Hai. Therefore, the group does not separate and Boromir remains for the duration of the trip. It is also assumed that the group are not captured by the Orcs as Frodo was and that Gandalf is not lost during the fight with the Balrog of Morgoth [1].

In order to determine the number of calories required for the journey, the calorific consumption by individual members of the fellowship was first considered. For this, Gimli, a dwarf, was modelled as a tall hobbit with an adjusted height, weight and BMI, (4ft, 44.59kg and 30, respectively) leading to a BMR of 2349.52 kcal/day [2]. Gandalf and Aragorn were also modelled as ordinary humans to simplify calculations. Therefore, the combined daily calorific consumption of the fellowship was calculated:

$$\begin{aligned} \text{Total BMR} &= (1818.61 \times 4) + (1702.2 \times 3) \\ &\quad + 2349.52 + 1416.95 \\ &= 16,147.68 \text{ kcal/day} \end{aligned}$$

This is equivalent to 672.82 kcal/hr. However, as the fellowship are not always at rest during the journey, activity levels along the trip were taken into account as resting, sleeping and active states.

The Journey to Mordor

It was initially assumed that the group slept for 8 hours per day, wherein their metabolic rate was considered equal to their basal rate. Time walking per day was obtained by considering the daily travel time required for them to walk at a standard pace. This pace was considered to be slightly slower than expected due to the adjustment for the hobbits and Gimli. Therefore, from the journey outlined in [3], by taking their travel from Redhorn Pass to Lothlórien (170 miles in 7 days), ~10 hours per day would have been required to walk at an average speed of 2.4 mph, just short of the 3-4 mph average human walking speed [4]. The slower speed could be attributed to the stride length of shorter company members and the challenge of climbing mountain paths. For a 24 hour day, this means that the remaining 6 hours account for rest time. For simplicity, resting time was modelled as ‘little to no exercise’.

Degree of exercise	Scale Factor	BRM x Scale Factor (kcal/hr)
Sleeping	1.000	672.82
Resting	1.200	807.38
Light	1.375	925.13
Moderate	1.550	1042.87
Heavy	1.900	1278.36

Table 1 – The table shows the scale factors by which the group total basal metabolic rate (672.82kcal/hr) must be multiplied in order to obtain the rate of metabolic activity per degree of exercise.

To determine the differences in metabolic rate for sleeping, moving and resting, different scale factors were applied to the combined group metabolic rate per hour [Table 1]. These scale factors [5] are well-known adjustments which can be made to the Harris-Benedict equation used in calculating the BMR from the previous paper [2]. The journey thus

consists of the steps relayed in [Table 2], where the multiple Warg attacks and the fight with the Balrog of Morgoth at Moria are considered ‘heavy’ exercise.

Journey	Travel time /days (hours)	Degree of Exercise
Imraldis to Eregion	19 (190)	Light
Eregion to Chamber of Mazarbul	3 (30)	Heavy
Chamber of Mazarbul to Lothlórien	2 (20)	Light
Caras Galadhon to Lothlórien	28 (280)	Resting
Lothlórien to Anduin	1 (10)	Light
Anduin to Parth Galen	9 (90)	Moderate
Parth Galen to Sammath Naur	30 (300)	Light

Table 2 – The table gives a series of stops along the journey in relation to events which took place, and hence, the degree of exertion for the company [3].

The total calories burnt at rest (6hr/day) during the journey are ~445,675.97 kcal and the calories used up when sleeping (8hr/day) are ~495,195.52 kcal. Using Tables 1 & 2, multiplying by a factor of 10 hours for the ‘active’ segment for each day, the total calories used are ~839,343.10 kcal. Therefore, the minimum number of calories required by the fellowship for the journey is ~1,780,214.59 kcal.

Conclusion

From [1], a cake of *lembas* would provide sustenance for an active man over the course of a day. Therefore, the total calorific content can be taken as the 1.55 x BMR_{man}, which is equal to 2638.50 kcal. To support the fellowship from Imraldis to Mt. Doom they would have to have carried a minimum of 675 pieces of *lembas*. Using hourly metabolic rates for the species, this is approximately 304 pieces for the hobbits, 214 for the ‘men’, 99 for Gimli and 60 for Legolas, assuming that they only eat their daily required amounts.

References

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