

Wool – The Miracle Fibre

*Comfort, Coolness, Resilience, Wrinkle Recovery, Absorption, Drape, Elasticity, Style,
Texture, Tenacity, Warmth*

Wool has it all – naturally

Try as they may, scientists have not been able to produce a single fibre to match the properties of wool

There is a common misconception that wool is best suited exclusively for warmth in cool conditions. Scientific tests however negate this concept and consistently show that wool is ideal for apparel and bedding in hot, humid, dry, cold or wet conditions.

Wool has unique attributes, which give it superior performance to other fibres in a number of ways. Our bodies continually produce heat at a rate dependant on our activity level, this heat must be dissipated to the surroundings in the form of perspiration, at the same rate at which it is produced, to keep the body temperature constant¹. When used in bedding wool creates a microclimate that assists in regulating body temperature and humidity. The degree to which body temperature and humidity is regulated is known as thermophysical comfort, that is, a state in which the individual is free from thermal stress.

Freedom from thermal stress is directly related to degree of rest. There are a number of thermophysical responses that can be measured to indicate how well rested a person is at any given time. Several studies examining and comparing the performance of wool blankets have consistently shown that in hot and cold conditions wool provides comfort and a more restful sleep than any other fibre type.

Umbach from the Holstein Institute in Germany, designed and undertook a series of studies to determine the measured responses which are most indicative of a rested nights sleep². He found that first and foremost that the heart rate is the most accurate indicator. A person with a slow and regular heart beat is far more relaxed than a person with a fast pace and/or irregular heart beat. Two factors, which will be reflected in the heart rate, are the temperature and humidity of the bed microclimate. It is a well-known fact that in order for the major organs of the human body to function efficiently, the core temperature must be maintained at or near 37°C.

Using the thermophysical responses related to sleep behaviour, Umbach monitored several body and climate functions to compare the performance of wool versus acrylic blankets³. Subjects were monitored in environment controlled (temperature, humidity and airflow) rooms. It was found that the pulse rate of sleepers under wool blanket was normal at 60 beats per minute, where as it rose erratically up to 80 beats per minute under the acrylic blanket, indicating greater stress on the sleeping person. This was easily explained by Umbach's other observations: the wool blanket absorbed 50% more perspiration than the acrylic blanket, and cotton pyjamas worn by the participant remained drier while they were under wool blankets. The microclimate under the acrylic blanket was too hot and humid for comfort.

The Ergonomics Unit at the Polytechnic of Wales compared comfort properties and sleep patterns of subjects sleeping under duvets rather than blankets⁴, again in an environment controlled room. When the bedroom was at 16°C, all sleepers were comfortable although the humidity under the wool duvet was lower. Interestingly, pulse rates under the wool filled duvets were again found to be lower than under the polyester filled duvets.

However, at 22°C the results were statistically discounted because the subjects under the polyester bedding exposed their limbs for periods of time in an effort to cool down. This response was poor substitute for the thermophysically controlled microclimate as found under the wool duvet.

A third trial designed by P.R Dickson used the subject's own room and bed as a control. Time-lapse photography monitored movement during the night to determine the sleep quality⁵. Dickson found statistically significant differences in the number of immobile periods, immobile sequences, and the percentage of the total time spent sleeping with the wool blanket compared with the acrylic surface. Again the wool blanket was proven to be the most restful surface to sleep upon.

The positive health effect of sleeping with wool is best illustrated by a study by Scott et al⁶ of low birthweight babies. This study found that babies nursed on lambs wool consistently showed a significant improvement in weight gain over and above those nursed by conventional methods using cotton.

Wool's comfort advantages have traditionally been attributed to the capacity of the fibre to absorb a significant proportion of its own mass as water^{a7}. Researchers agree that more than simply absorb, wool fibres have the ability to buffer by reacting to the humidity level within the particular environment. As the humidity rises, wool will absorb and store moisture as required. When the level decreases, the fibre releases the moisture thus regulating the microclimate. This property ensures that a damp, clammy feeling will never be experienced with wool. In this way, instead of the body regulating the microclimate, the wool bedding acclimatizes the body, ensuring a healthier rest with an even heart rate and blood pressure.

Another advantage of wool over other fibres is its outstanding insulating properties especially when compared with synthetic fibres⁸. The unique three-dimensional form of wool allows it to trap small pockets of air, thus giving it an insulating property. This property ensures that temperature changes are slow and gradual so that the bed's microclimate has time to equilibrate. Rapid changes in heat loss or gain would hinder temperature and humidity regulation.

Wool's natural resilience, is another property which aids comfort. The pile of an underlay will reduce pressure points and cushion the body. Tests using underlays with elderly and bedridden patients in hospitals have shown dramatic differences between the performance of wool and polyester bedpads. The following results clearly identify the advantages of wool.

Patients on wool had significant fewer skin problems than those on polyester pads. 77% of those on wool had no problems compared to 38% on polyester. Of those with decubitus, only 8% had a problem for more than one month while 38% on polyester had problems for a period for more than one month. In addition, no patients on wool pads had renewal of skin irritation once the initial problem had cleared up, while 14% had repetitive periods of irritation on polyester^{b9}. The health aspects of sleeping on wool continually outrank similar synthetic products.

^a Wool can absorb 33.9% of its weight in water compared with synthetics at 0-4%, cotton 8%

^b Sample space of twenty-six on wool underlays and twenty-one on polyester

An additional benefit to using wool products for bedding is the peace of mind in knowing wool is naturally resistant to ignition and is self-extinguishing. Perhaps the most dramatic demonstration of this was a trial developed to evaluate wool and polyester overlays to the British Standard B.S 7175. The ignition sources were, from one to six; a cigarette, 3 butane flames (the smallest of which represents a burning match) and 4 wooden cribs of various weights.

Results showed that the mattress assembly containing the wool underlay was capable of resisting ignition source 5, (wooden crib 16g) with no evidence of progressing smoldering. The polyester overlay however, when tested with a simulated match (ignition source 2) was found to act as a secondary source of ignition requiring extinguishing after eight minutes¹⁰. The ignition sources are numbered relative to their propensity to ignite the test material.

Wool with its unique physical properties is the ideal fibre for bedding applications, it has been subjectively and scientifically proven from a number of perspectives that wool has the advantage over other fibre types. Irrespective of whether wool is used for protection or comfort, its applications are suitable for conditions ranging from hot and humid tropics to the harsh and freezing Antarctic.

Wool has it all:-

- superior insulation
- resilience
- moisture absorption
- moisture buffering
- flame resistance
- therapeutic value

On wool, nature's miracle fibre, you will rest comfortably, safely and rest assured.

Bibliography

¹ "Wool – Why is it comfortable?", B.Holcombe, Proceedings of the 8th Int. Wool Text. Res. Conf., Vol V., Fibre assemblies and product Properties, ed G.H Cranshaw (WRONZ) 1990, 205-214.

² "Comparative Thermophysical tests on Blankets Made From Wool and Acrylic-Fibre-Cotton Blends", K.H.Umbach, J.Text. Inst., 1986, No.3.

³ "Comparative Thermophysical Tests on Blankets Made From Wool and Acrylic-Fibre-Cotton Blends", K.H.Umbach, J.Text. Inst., 1986, No.3.

⁴ "An Ergonomic Comparison of Wool and Polyester-Filled Quilts", Polytechnic of Wales, Ergonomics Unit, published in IWS Technical Letter Number 26.

⁵ "Effect of a fleecy woollen underlay on sleep", P.R.Dickson, The medical Journal of Australia, January 21, 1984, p87-89

⁶ "Weight Gain and movement patterns of Very Low Birthweight Babies Nursed on Lambswool", S.Scott, P.Lucas, T.Cole and M.Richards, Child care and development Group University of Cambridge and the MRC Dunn Nutrition Unit Cambridge, Oct 1980-Sept 1981.

⁷ W.E Morton and J.W.S Hearle, Physical Properties of Fibre, The Textile Institute Manchester, 1986 Edition

⁸ W.E Morton and J.W.S Hearle, Physical Properties of Fibre, The Textile Institute Manchester 1986 Edition.

⁹ "Wool Pile Sliver Knit Bedpan Evaluation at Franklin Park Nursing Home", L.R.Mizell, W.H.Marsden and V.Butler, Summary report by New Market Outlet Section, IWS November 1974.

¹⁰ CPB-99 "The Flammability Performance of Wool and Polyester Mattress Overlays", R.Woolin, J.L.Webb, IWS Technical Information Bulletin, 29 June 1987.

