A treatment planning system is developed to perform light dose calculation and optimization for interstitial prostate photodynamic therapy (PDT). This procedure inserts linear light sources of various lengths to various depths within the matrix of parallel catheters perpendicular to a base plate to cover the prostate gland. Since the light penetration is dependent on the optical properties of the prostate (absorption $\mu_a$ and reduced scattering coefficient $\mu_s'$), which may change over time, it is essential to calculate and optimize light dose distribution in real-time. We have developed an improved diffusion model to calculate light fluence rate as a function of $\mu_a$ and $\mu_s'$ for linear sources to the prostate volume and the critical structures (urethra and rectum). Light dosimetry was performed in-vivo to determine tissue optical properties. Several global optimization algorithms are used to optimize the weight of the light sources to achieve uniform light dose distribution. The effect of weight optimization depends greatly on the optical properties. When light penetration depth ($\delta = 1/\mu_{a0}$) is larger than twice the spacing between light sources, optimization has a significant effect. On the other hand, when light penetration depth is smaller the spacing between light sources, geometrical distributions of the light sources alone determine the shape of light dose distribution. Typical light penetration depth is comparable to the dose distribution from an I-125 source. This system has the potential to be developed into an integrated system to dynamically optimize light dose distribution.