

The Effects of Cleaning and Disinfection on Tinted Hydrogel Contact Lenses

A Senior Research Project by:

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Abstract

With the increased popularity of tinted soft contact lenses and the lack of information on which cleaning and disinfection methods would best preserve the tint in the lenses, this study set out to determine which cleaning and disinfection method would least affect the lens tint.

Introduction

The study was designed to determine the extent of fading that occurred when tinted soft contact lenses were subjected to four different cleaning and disinfection systems. The results could be used to determine which system should be used on tinted soft contact lenses to minimize potential fading.

Materials and Methods

The study used two manufacturer's lenses and they were Ciba Soft Tints and Custom Tint Laboratories Custom Eyes 38 from Bausch and Lomb. Two colors from each company were used; blue and green from Ciba and Sapphire and Emerald from CTL. (All lenses were -3.00 D in power so as to maintain consistent lens thickness). These lenses were cleaned and disinfected with four different systems.

The first system utilized Alcon's Opticlean as a cleaner and Lens Plus saline and thermal disinfection. The second system also utilized Opticlean as a cleaner and chemical disinfection with Flexcare. The lenses in the above two systems were cleaned by rubbing in the palm of the hand for 20 seconds then rinsed with Lens Plus saline followed by their respective disinfection method which constituted one cleaning and disinfection cycle. The third system also used Bausch and Lomb daily cleaner and Lens Plus saline; this was followed by a ten minute disinfection soak in Lensept hydrogen peroxide then placed for an average of a four hour soak in Lens Plus saline with the platinum catalytic disc which served to neutralize the residual hydrogen peroxide and this was one cleaning and disinfection cycle. This third system is the traditional Septicon system. With the fourth system the lenses were cleaned with Bausch and Lomb daily cleaner for 20 seconds and rinsed with Lens Plus saline followed by a 12 hour disinfection soak in Lensept hydrogen peroxide and this accounted for one cleaning and disinfection cycle. There was no need for neutralization of hydrogen peroxide because it was broken down chemically to water and oxygen over the duration of the soak.

The transmitting curves of the lenses were measured with a Bechman DB model spectrophotometer with transmission recorded between wavelengths of 350 to 750 nanometers. Each transmission graphing consisted of 41 points recorded at 10 nanometer intervals across the chosen spectrum. The lenses were subjected to five graphings; baseline and every 15 cycles thereafter. The spectrophotometer was linked to an IBM personal computer so all graphs could be stored on floppy disc.

Results

Figures one to sixteen shows percent transmission versus wavelength in nanometers for baseine, 30 cycles and 60 cycles. Each curve is the average of three lenses, each lens of the same manufacturer, color and cleaning and disinfection system. The Opticlean-heat system, as represented by figures 1-4, most affected the green Ciba lenses as shown by figure three.

The Opticlean-Flexcare system appeared to have very little affect on any of the lenses. (fig. 5-8)

The Septicon system had a dramatic affect on all lenses particularly the blue Ciba lenses (fig 9) and emerald CTL lenses. (fig 12)

The overnight hydrogen peroxide system had significant affects on all but the green Ciba lenses (figs 13-16) over the entire chosen spectrum.

Discussion

Figures 17-20 show percent change in transmission versus wavelength in nanometers for each manufacturer's color lens. There are four graphings per figure, one for each cleaning disinfection system.

Figure 17 shows that the system which caused the least fading for the blue Ciba lenses was the Opticlean-Flexcare system followed by the Opticlean - heat system, overnight hydrogen peroxide system and finally the Septicon system which caused the most fading of the lens tint.

Figure 18 also shows that the Opticlean-Flexcare produced the least amount of fading and in fact the lens tints remained relatively unchanged. The next best system appears to be the Opticlean-heat system followed by the Septicon system, an overnight hydrogen peroxide system depending on which end of the spectrum is under consideration.

Figure 19 shows again that the Opticlean-Flexcare system caused the least amount of tint fading and is followed closely by the overnight hydrogen peroxide system. The next best system would appear to be the Septicon system and the system which produced the most fading of tint was the Opticlean-heat system.

Finally figure 20 shows that once again the Opticean-Flexcare system produced the least amount of fading. This was followed closely by the Opticlean-heat system and the overnight hydrogen peroxide system. The most significant fading was produced by the Septicon system.

Conclusion

The study set out to determine which cleaning and disinfection system would best preserve the tint in the tinted soft contact lenses. Our data clearly shows that the Opticlean-Flexcare combination proved to be the best of the four systems tested. The next best method for most tinted lenses is the Opticlean-heat system. If hydrogen peroxide disinfection is used with tinted soft contact lenses one must realize that more fading may occur. The most fading in this study occurred when using the platinum catalytic disc as in the traditional Septicon system. Therefore, it is important to consider these affects when dispensing tinted soft contact lenses to your patients.

Acknowledgements: Thanks to Glenn Hammack, O.D. for interfacing the computer to the spectrophotometer, writing the software and help with the data analysis and to Kurt McKenney for his assistance.

OPTICLEAN-HEAT SYSTEM
BLUE CIBA LENSES
TRANSMISSION CURVES

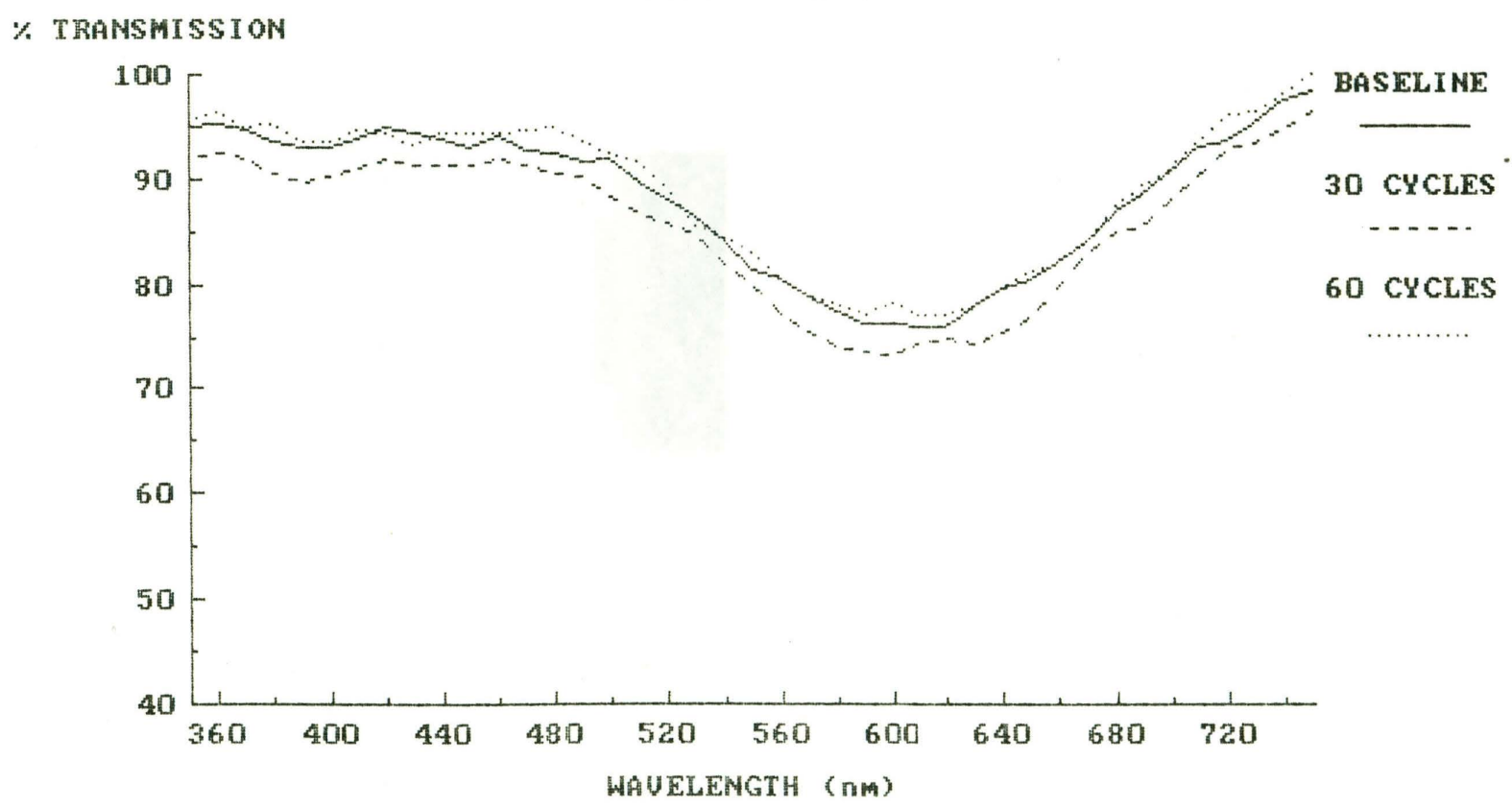


Fig 1

OPTICLEAN-HEAT SYSTEM
SAPPHIRE CTL LENSES
TRANSMISSION CURVES

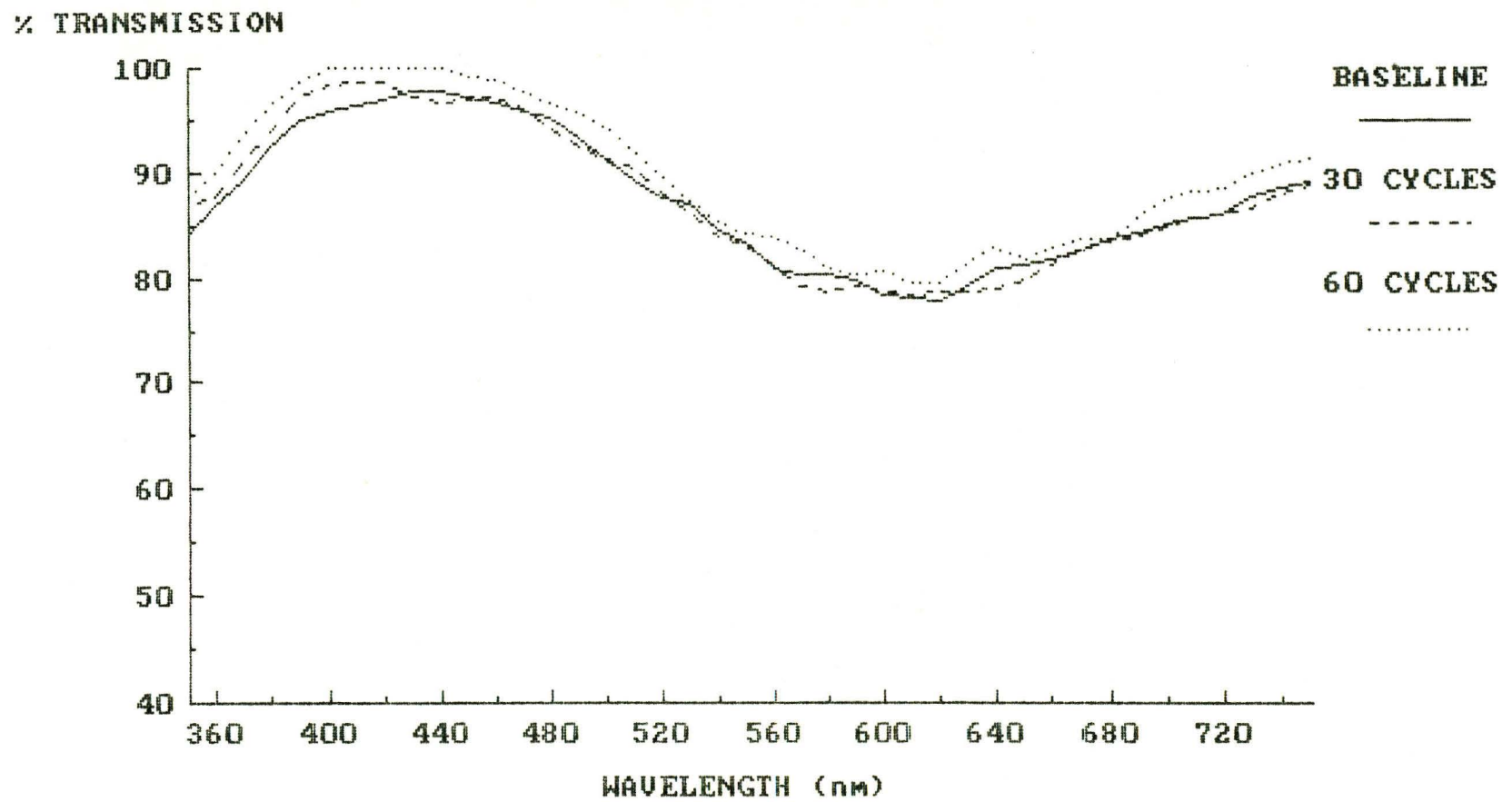
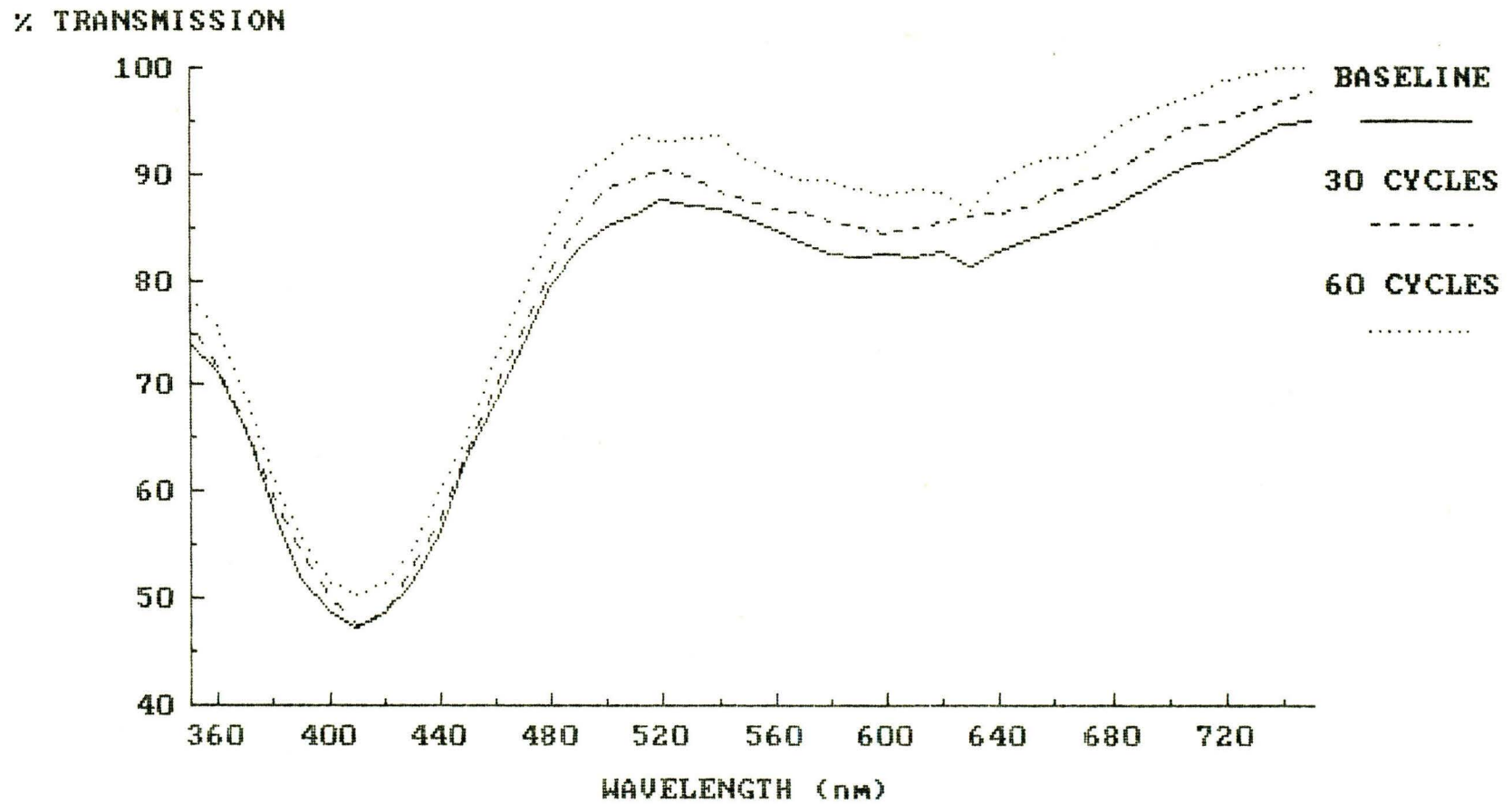
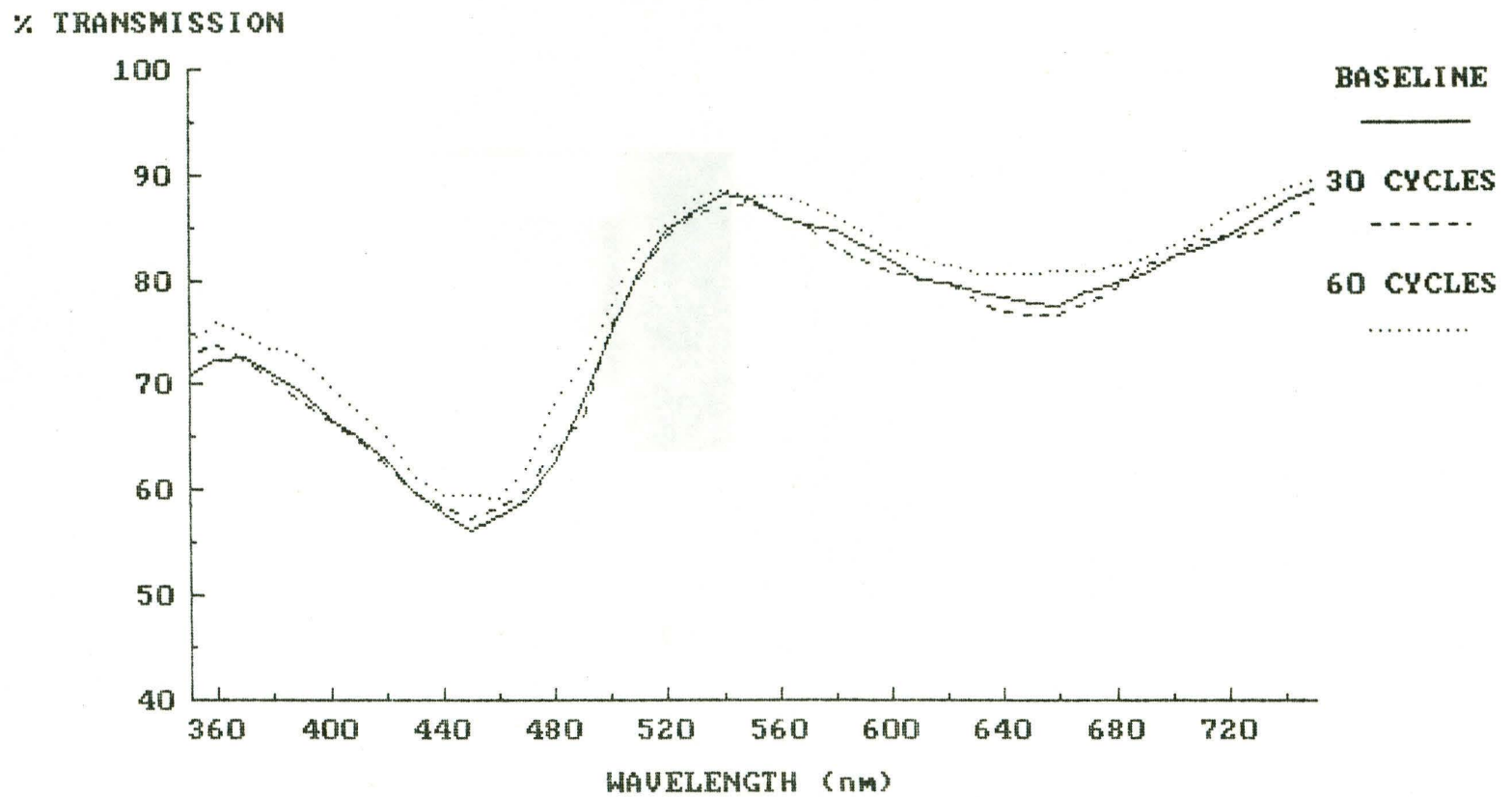


Fig 2

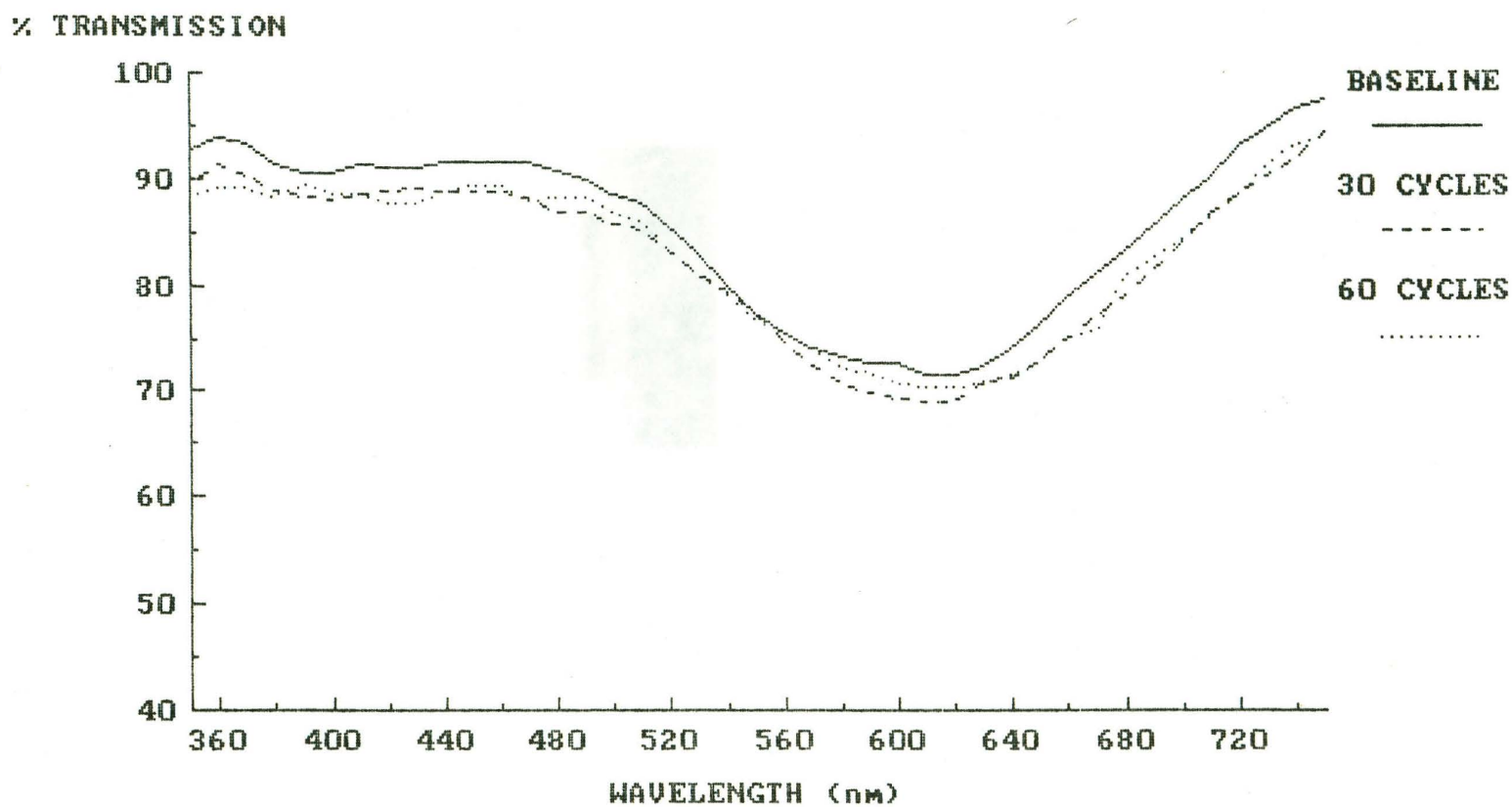
OPTICLEAN-HEAT SYSTEM
GREEN CIBA LENSES
TRANSMISSION CURVES



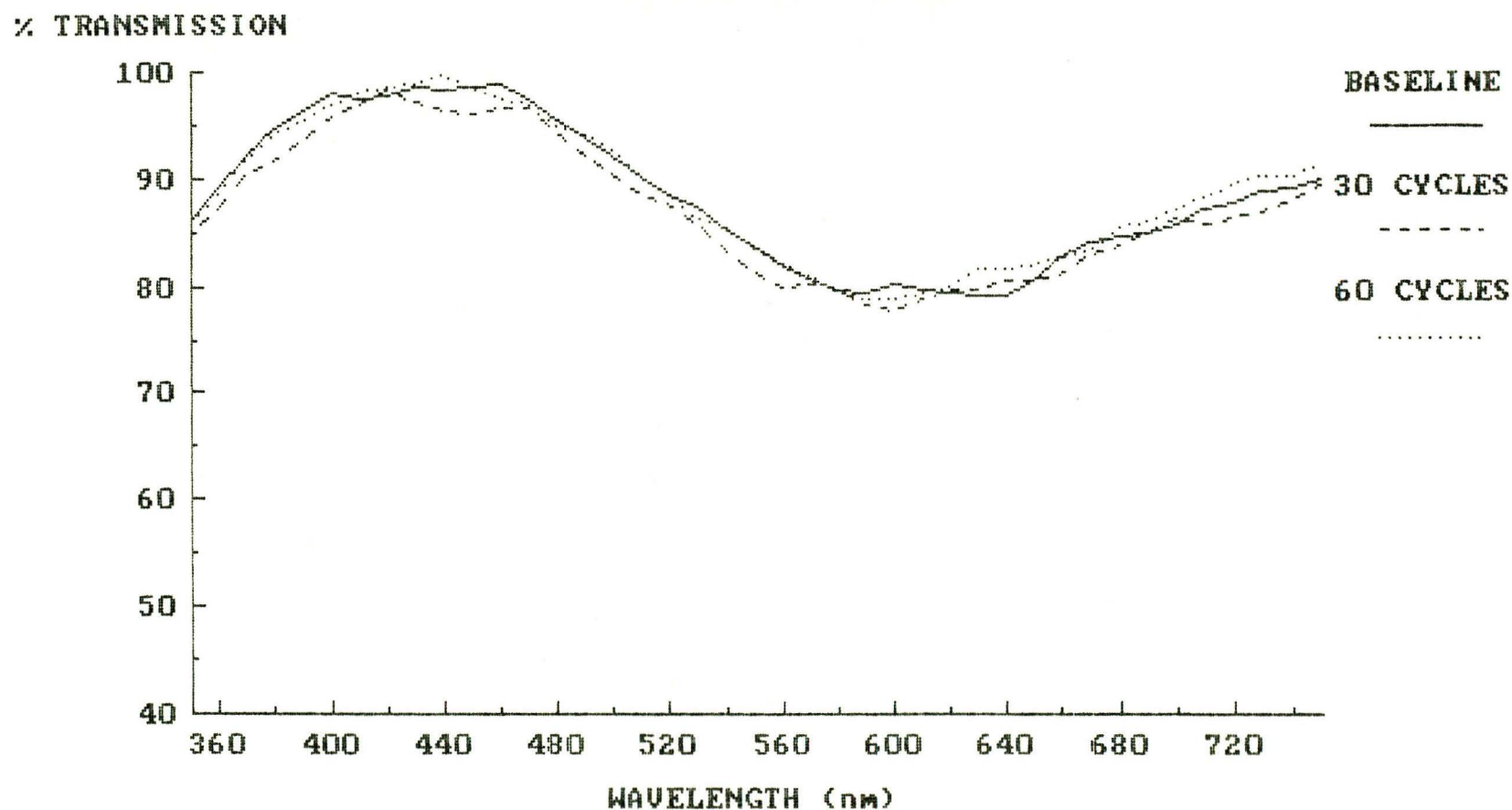
OPTICLEAN-HEAT SYSTEM
EMERALD CTL LENSES
TRANSMISSION CURVES



OPTICLEAN-FLEXCARE SYSTEM
BLUE CIBA LENSES
TRANSMISSION CURVES

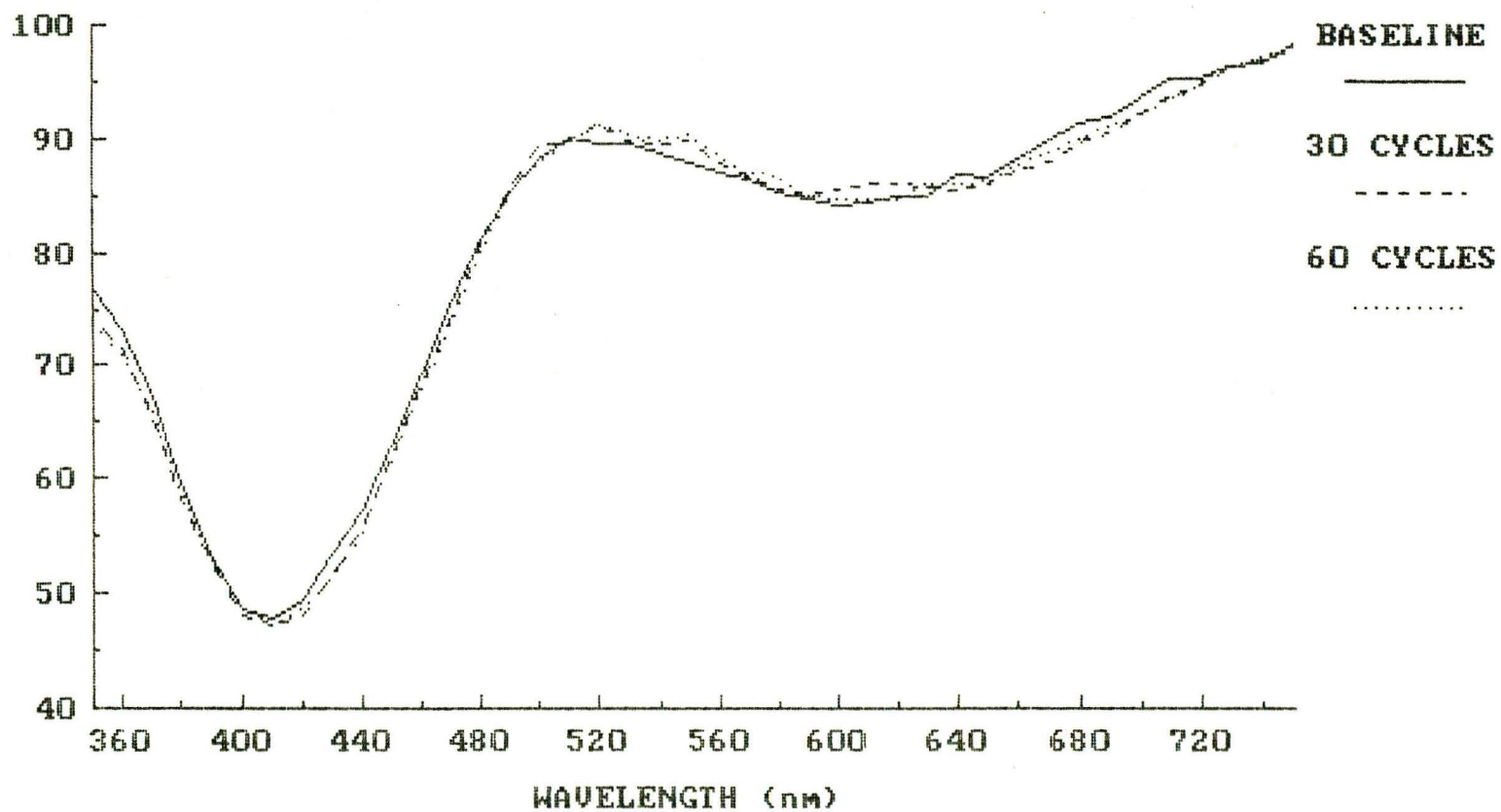


OPTICLEAN-FLEXCARE SYSTEM
SAPPHIRE CTL LENSES
TRANSMISSION CURVES



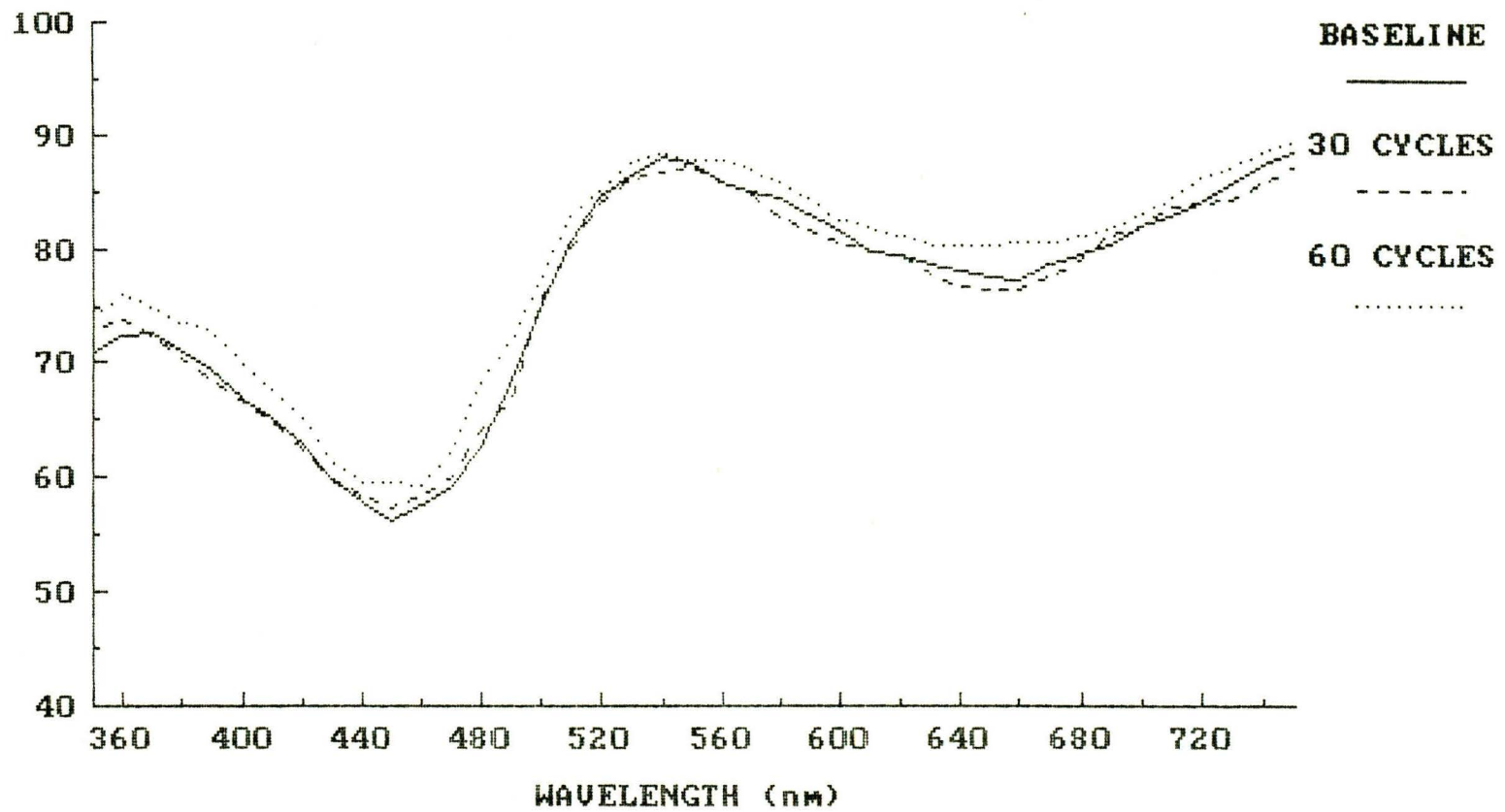
OPTICLEAN-FLEXCARE SYSTEM
GREEN CIBA LENSES
TRANSMISSION CURVES

% TRANSMISSION



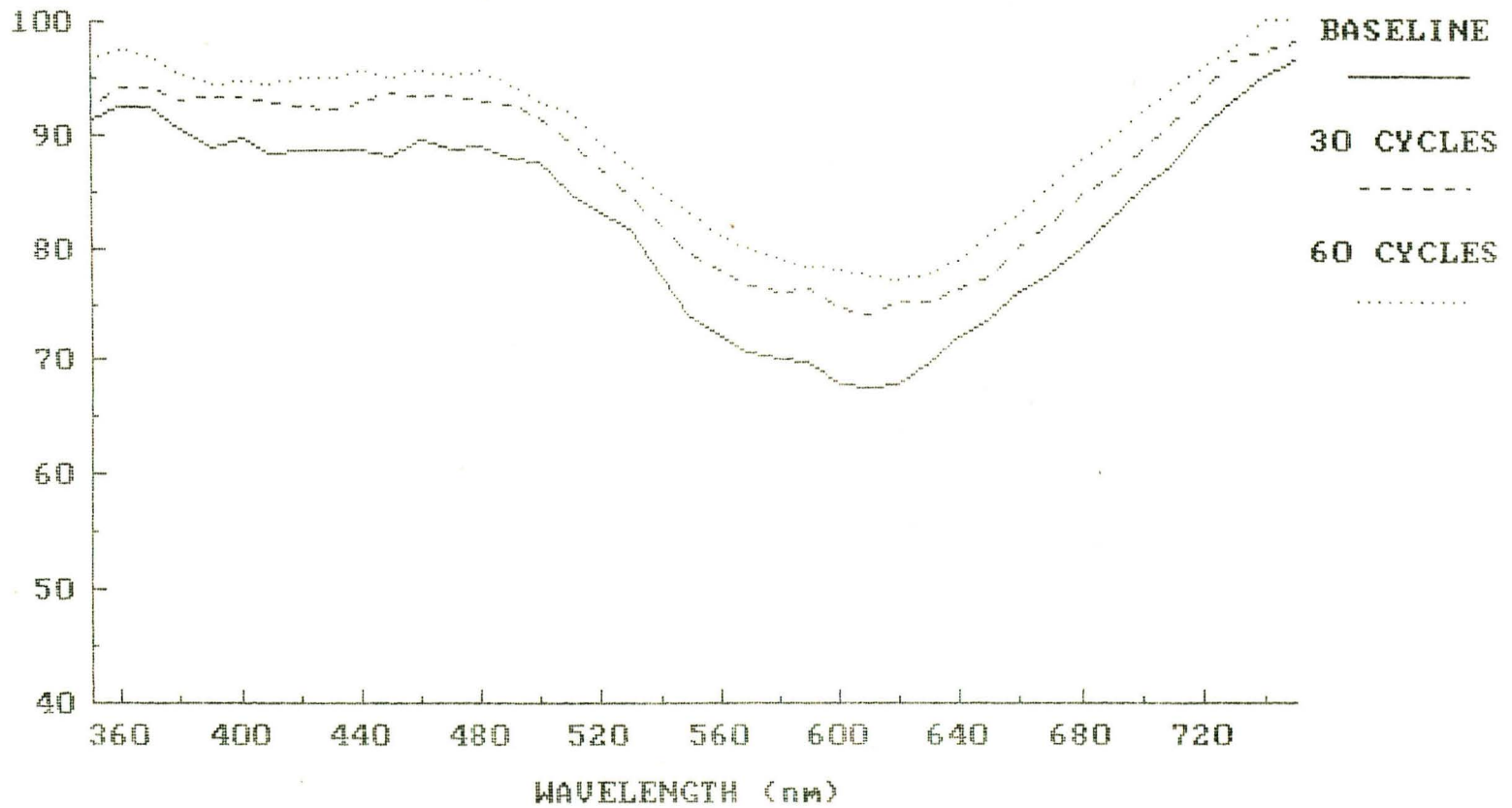
FLEXCARE
OPTICLEAN-HEAT SYSTEM
EMERALD CTL LENSES
TRANSMISSION CURVES

% TRANSMISSION



SEPTICON SYSTEM
BLUE CIBA LENSES
TRANSMISSION CURVES

% TRANSMISSION



SEPTICON SYSTEM
SAPPHIRE CTL LENSES
TRANSMISSION CURVES

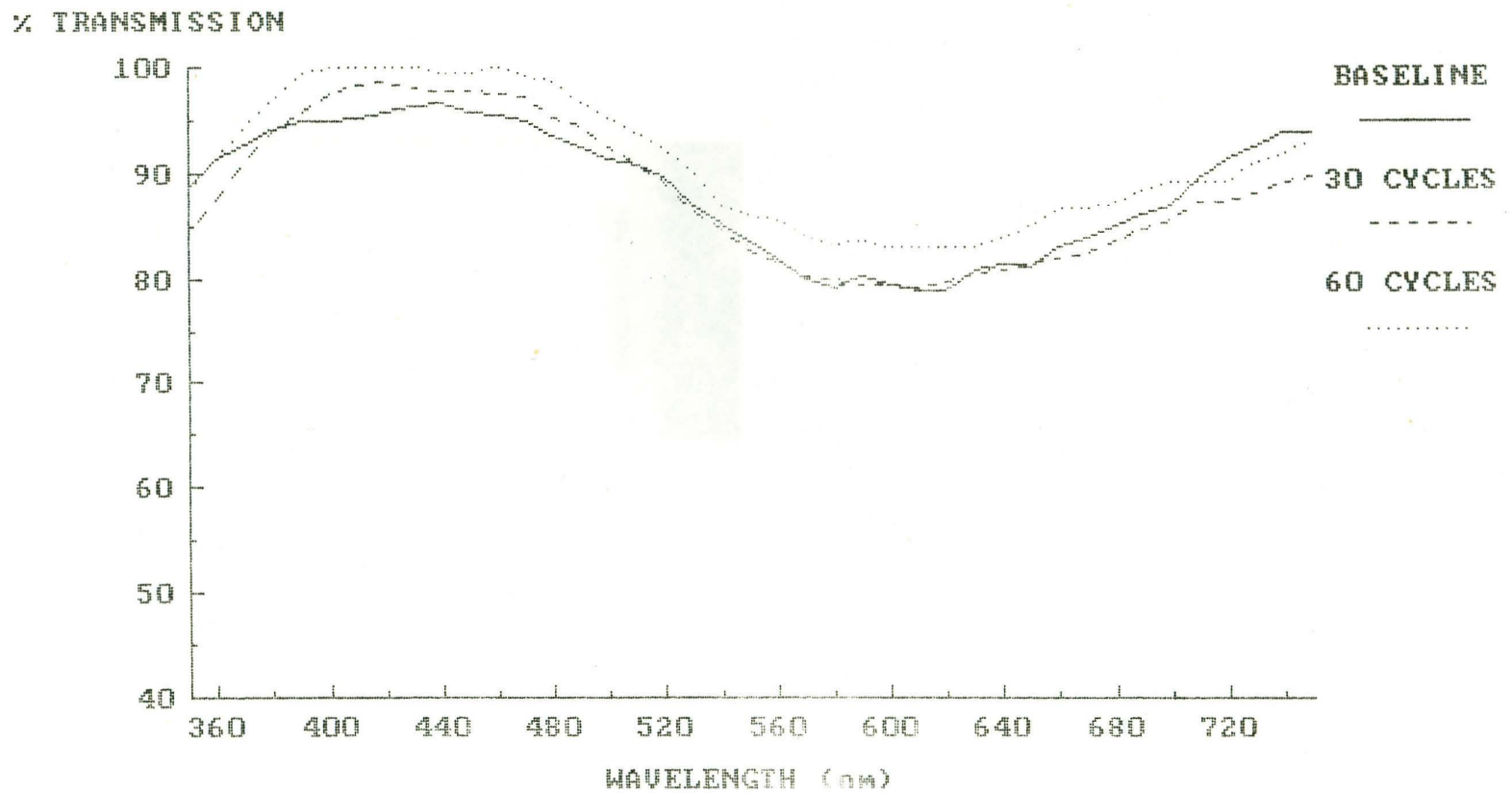


Fig. 1D

SEPTICON SYSTEM
GREEN CEM LENSES
TRANSMISSION CURVES

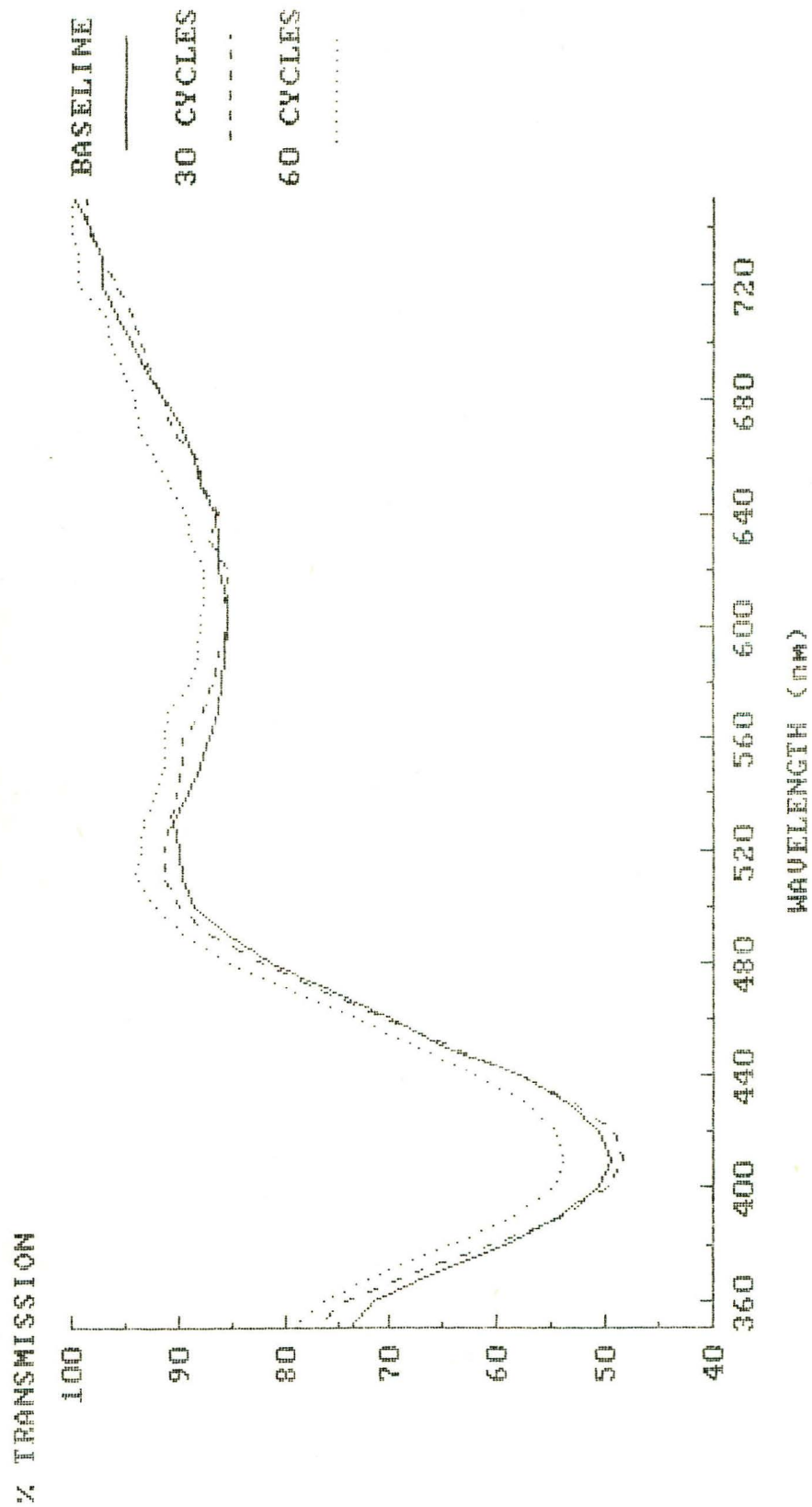


Fig-11

SEPTIC SYSTEM
THREAD GL LINES
TRANSMISSION CURVES

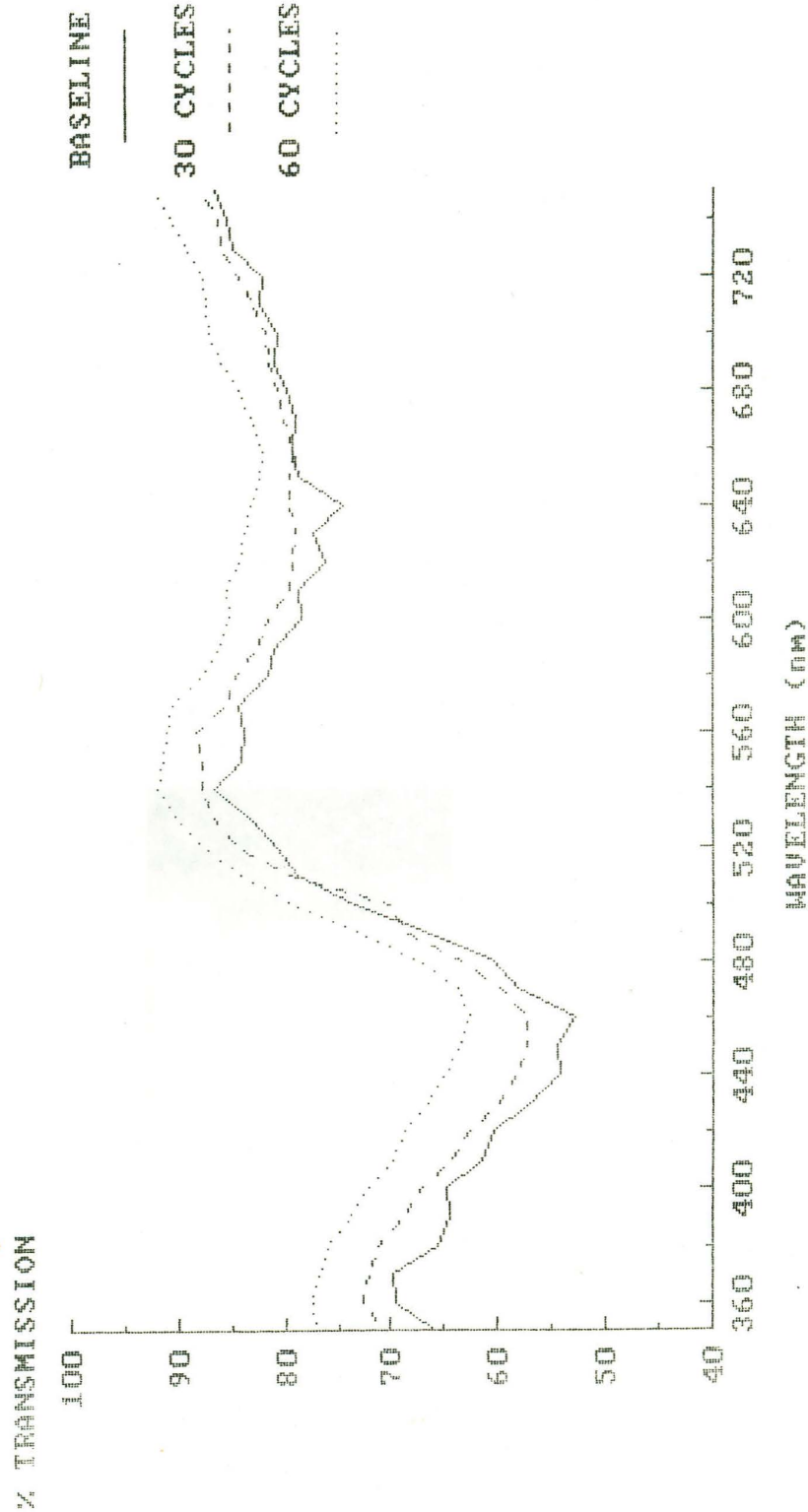
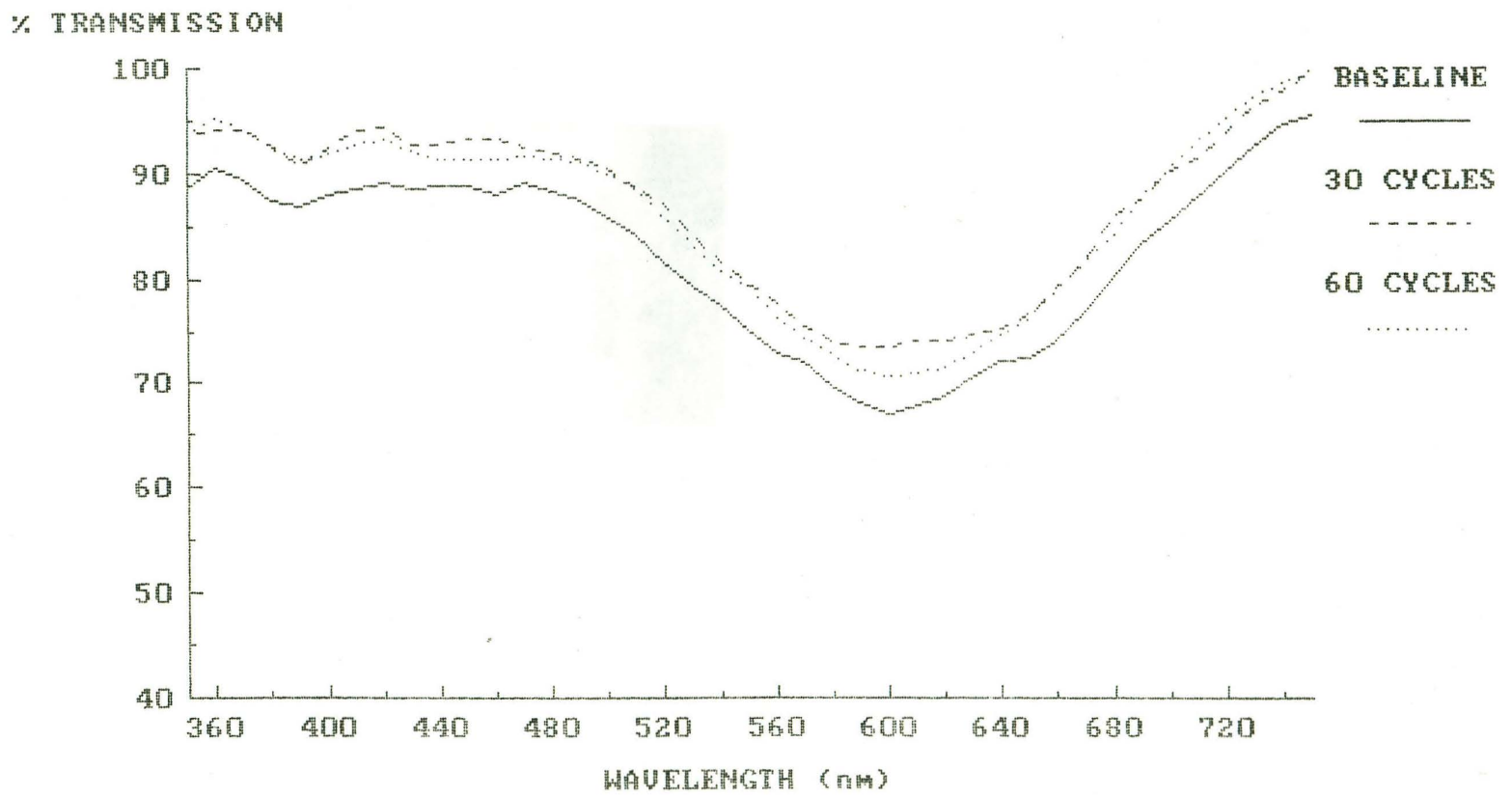


Fig. 12

OVERNIGHT HYDROGEN PEROXIDE
BLUE CIBA LENSES
TRANSMISSION CURVES



OVERNIGHT HYDROGEN PEROXIDE
SAPPHIRE CTL LENSES
TRANSMISSION CURVES

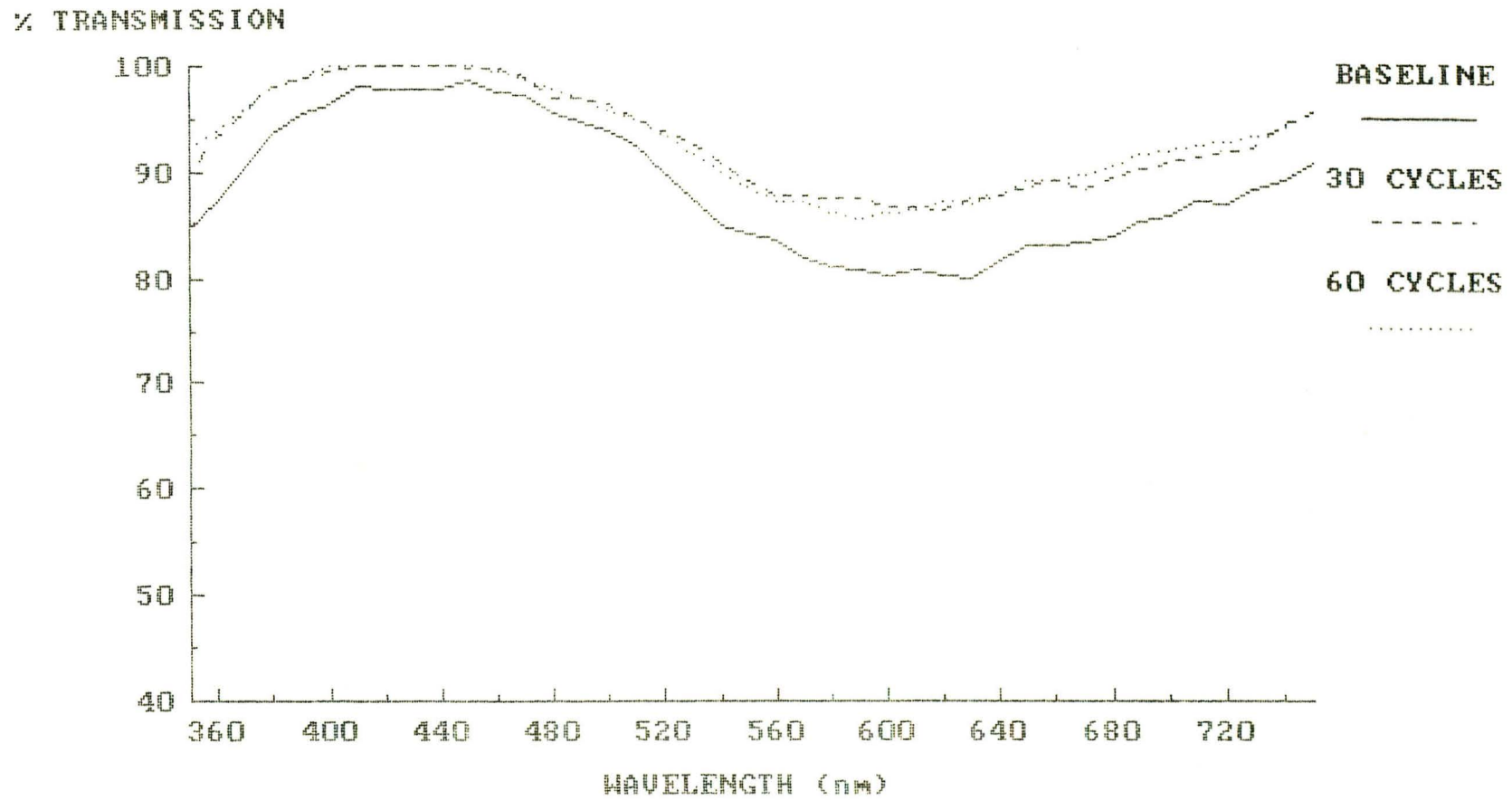
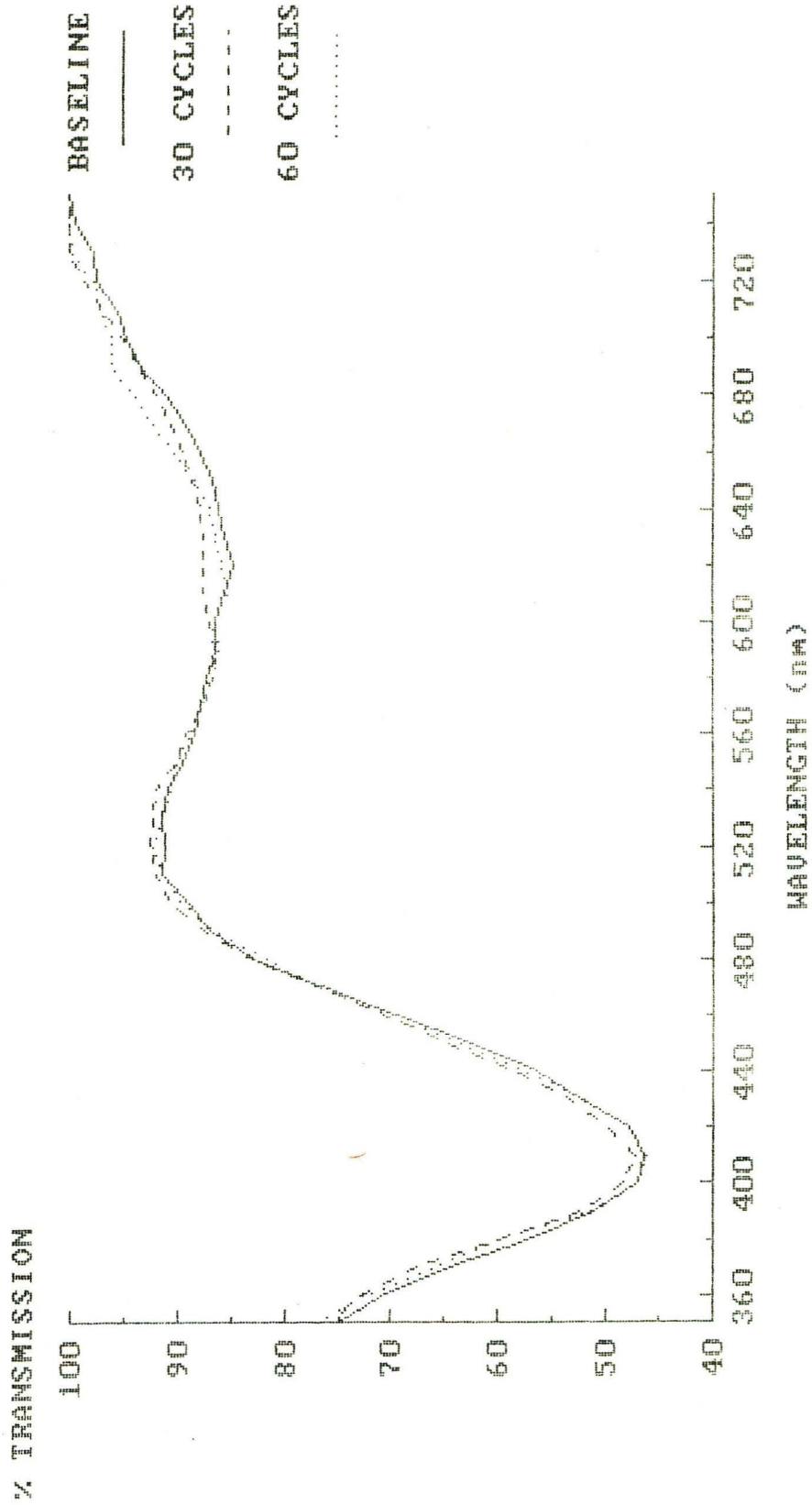


Fig. 14

WEIGHT HYDROGEN PEROXIDE
GREEN COB LENSES
TRANSMISSION CURVES



OVERNIGHT HYDROGEN PEROXIDE
EMERALD CTL LENSES
TRANSMISSION CURVES

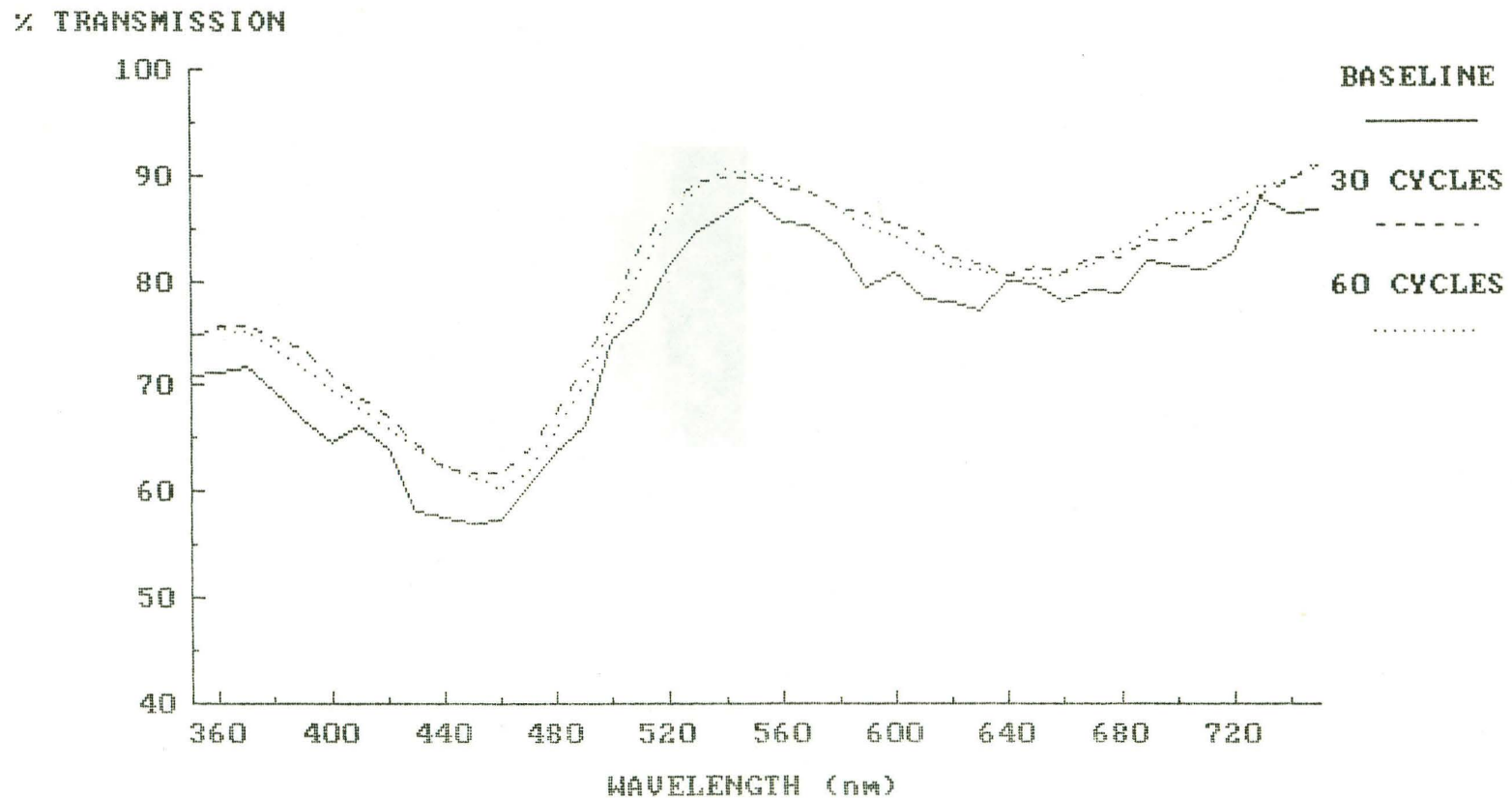


Fig-16

CHANGE IN TRANSMISSION
AFTER 60 CLEANING CYCLES
BLUE CIBA LENSES

CHANGE IN TRANSMISSION (%)

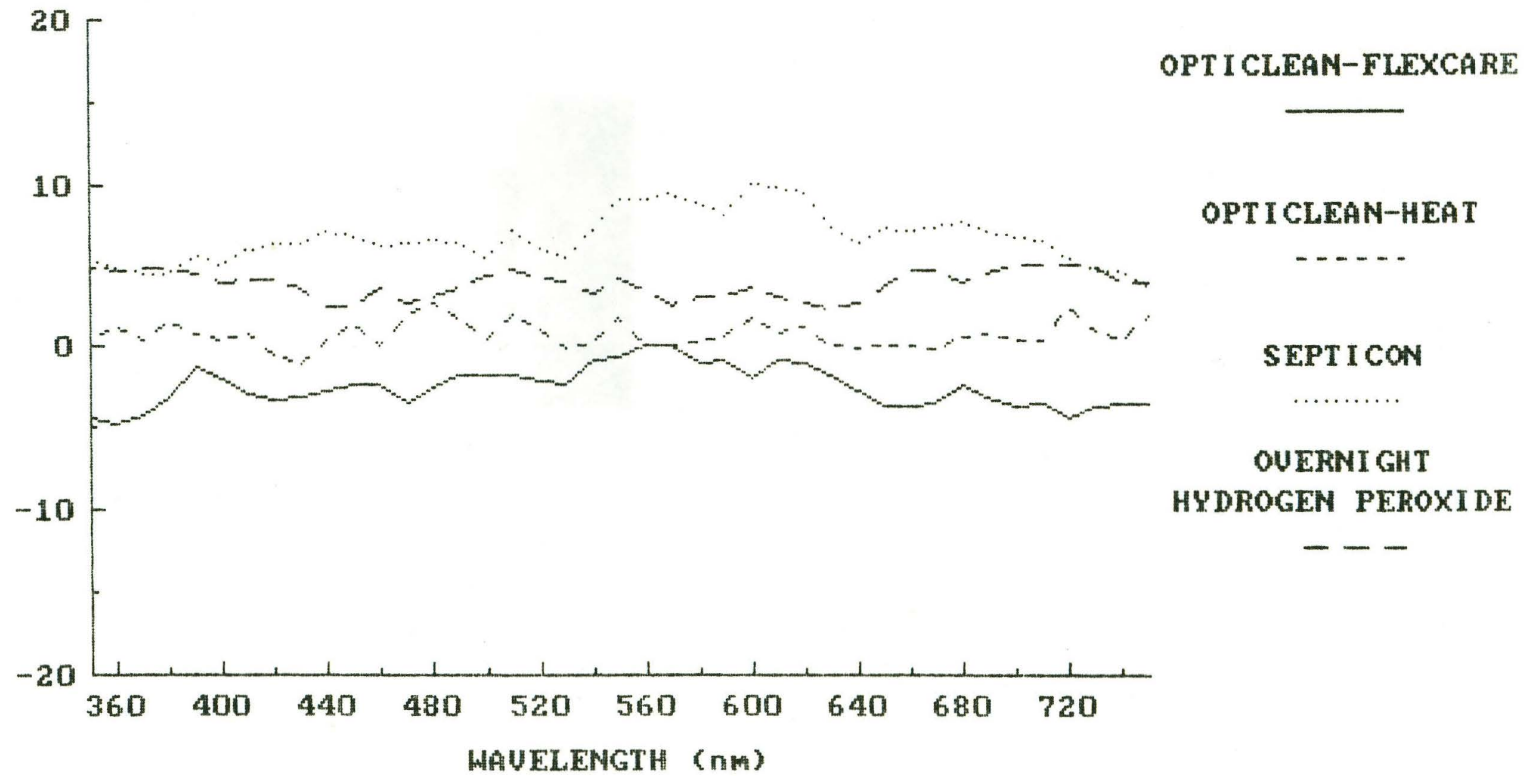
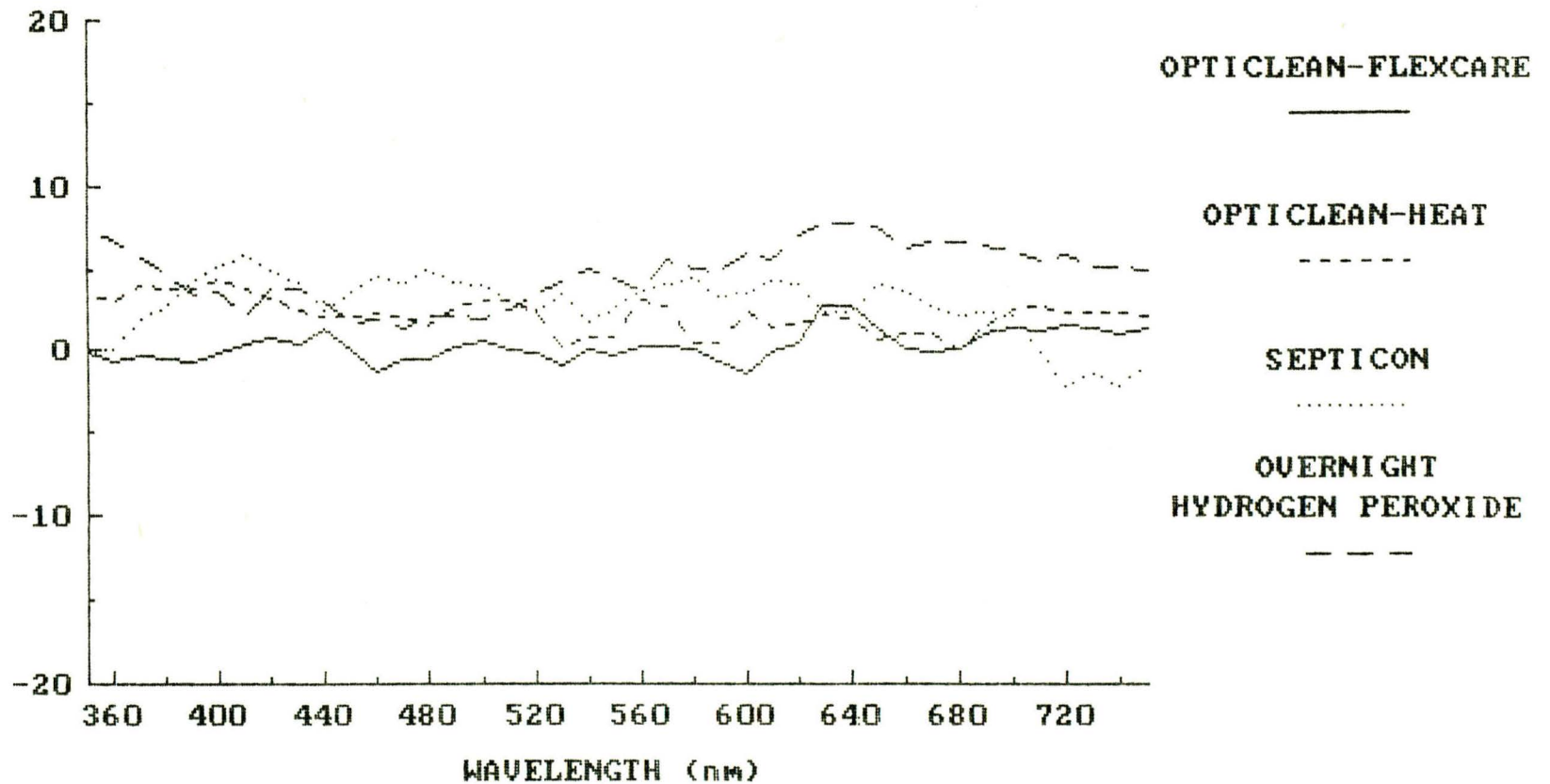


Fig. 17

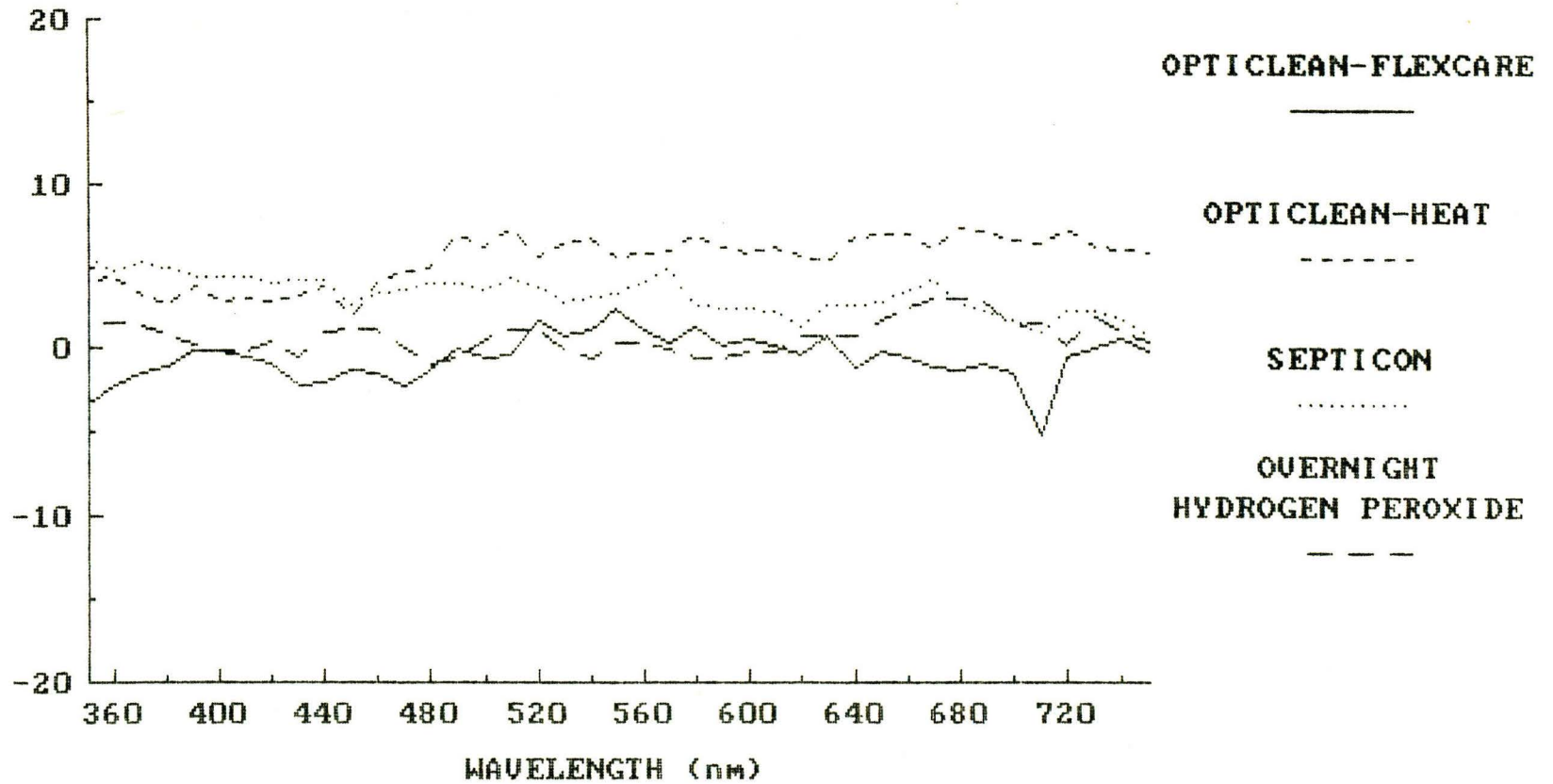
CHANGE IN TRANSMISSION
AFTER 60 CLEANING CYCLES
SAPPHIRE CTL LENSES

CHANGE IN TRANSMISSION (%)



CHANGE IN TRANSMISSION
AFTER 60 CLEANING CYCLES
GREEN CIBA LENSES

CHANGE IN TRANSMISSION (%)



CHANGE IN TRANSMISSION
AFTER 60 CLEANING CYCLES
EMERALD CTL LENSES

CHANGE IN TRANSMISSION (%)

