Evaluation of the Factors Contributing to Levonorgestrel Binding in Addition Cure Silicone Elastomer Vaginal Rings


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EVALUATION OF THE FACTORS CONTRIBUTING TO LEVONORGESTREL BINDING IN ADDITION CURE SILICONE ELASTOMER VAGINAL RINGS

Karl Malcolm 1, Diarmaid Murphy 1, Clare McCoy 1, Peter Boyd 1, Sandeep Kumar 1, Susan Fetherston 1, Andrew Brimer 2, Jonathon Holt 2, Wendy Blanda 2, Brid Devlin 2, Jeremy Nuttall 2, Chris Gilmour 2, Tiffany Derrick 2

1 Queen’s University Belfast, UK, 2 International Partnership for Microbicides (IPM), USA.

With the dexpipirine (DPV)-releasing silicone elastomer (SE) vaginal ring (VR) now in Phase III clinical studies, there is now considerable interest in developing next-generation rings that could additionally provide contraception. Levonorgestrel (LNG) is a second generation synthetic progestin used as an active ingredient in various hormonal contraceptives, including oral pills, intrauterine devices, and contraceptive implants. It is also the lead progestin candidate for use in future multipurpose prevention technology (MPT) products. Despite having previously been incorporated into SE devices, LNG’s propensity to react with addition cure SE systems has scarcely been reported. Here, we investigate this phenomenon and offer some solutions.

SEs are available with different cure chemistries. Addition-cure SEs involve the platinum-catalysed reaction between two types of silicone polymer – one containing silane groups (Si–H) and the other containing vinylsilanes (Si=CH2) (Fig. 1). These systems are preferred for medical and drug delivery applications, since they do not produce reaction by-products. However, certain systems have scarcely been reported. Here, we investigate this phenomenon and offer some solutions.

A problem with LNG-loaded SE VRs was first noted with combination DPV (200mg) – LNG (32mg) matrix-type rings manufactured (60°C, 90 s cure time) using micronised LNG and MED-4870, a high-temperature addition-cure SE supplied by Nusil. Specifically, the rings showed zero in vitro release of the active ingredient in various hormonal contraceptives, including oral pills, intrauterine devices, and contraceptive implants. It is also the lead progestin candidate for use in future multipurpose prevention technology (MPT) products. Despite having previously been incorporated into SE devices, LNG’s propensity to react with addition cure SE systems has scarcely been reported. Here, we investigate this phenomenon and offer some solutions.

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