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Review

# Uterine peristalsis and fertility: current knowledge and future perspectives: a review and meta-analysis

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Dr Nienke Kuijsters obtained her medical degree in 2013 in the Netherlands. Since 2012 she has been involved in research on dynamics and measurement of contractions in non-pregnant uteri. In 2015 she started as a PhD candidate at the University of Technology in Eindhoven (the Netherlands), focusing on objective measurement of uterine peristalsis. The research is under supervision of professor Dr Schoot, who is a gynaecologist specialized in minimal invasive surgery and fertility. Since 2015 he is also a visiting professor at the Ghent University Hospital, Ghent, Belgium.

**KEY MESSAGE**

Uterine contractions play their part in fertility. However, to use them to improve pregnancy rates we need more research on their physiology and on the development of an objective, patient- and user-friendly measuring tool to identify and monitor patients with (ab)normal uterine activity, and the effect of potential therapies.

A B S T R A C T

Although uterine contractions in the non-pregnant uterus have been studied extensively, the knowledge gained has not been used in general fertility treatment work-up. In this review paper, we provide an overview of the current knowledge on uterine peristalsis (UP), based on the available literature. This literature shows that UP influences pregnancy chances in both natural and artificial cycles. Although the physiological background of these contractions is not completely clear, we know that several factors can be of influence, like uterine pathologies and hormones. Several options to alter pregnancy outcome by interfering with uterine contractions have been studied. Our meta-analysis on therapeutic options shows positive results of progesterone at time of embryo transfer in IVF cycles or prostaglandins at time of intrauterine insemination, although the quality of evidence is low. These therapies are probably most beneficial in selected groups of patients with abnormal contraction patterns. The introduction of an objective and user-friendly UP measuring tool suitable for use in daily practice would make it possible to identify and monitor these patients. We suggest that future research should focus on the physiology of initiation of UP and on the development of an effective standard measuring tool.



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## Introduction

Success of fertility treatment is moderate, and generally remains at about 30% per cycle. In a substantial number of these patients no underlying reason for failure can be found, and hence no causal treatment is available. In fertility treatment, the least controlled phase of the treatment is the period between embryo transfer and pregnancy testing. In this phase, uterine peristalsis (UP) plays its part in nidation (Fanchin and Ayoubi, 2009; Fanchin et al., 1998; Ijland et al., 1997a; Zhu et al., 2014). Knowledge of UP might provide an insight into a patient's fertility status and improve treatment.

Although this factor influencing fertility has been studied extensively since the 1990s, initially promising research results have not yet found their way into widespread clinical application. Although research on UP has lost its initial novelty, papers published on a regular basis demonstrate that this topic is still of interest. Over the years, researchers from various specialisms have compiled a significant amount of data. Still, a summary of the existing knowledge to date does not exist.

In this review, we provide a complete overview of research performed to date on contractions in the non-pregnant uterus. Topics include the embryological and physiological origin of uterine contractions (UC), different measuring methods, their clinical relevance, different mechanisms involved in UP control, and therapeutic approaches to enhance fertility. In conclusion, the potential direction of future research on this topic is discussed.

## Methods

In a number of different phases, we searched PubMed for works published from 1900 to January 2016, looking for different subjects and using a variety of keyword combinations. We combined the terms 'uterine contractions', 'uterine peristalsis', 'endometrial waves' and 'junctional zone contractions' with terms including 'IVF', 'in-vitro fertilization', 'assisted reproductive techniques', 'pregnancy rate', 'implantation rate', 'embryology', 'histology', 'interstitial cells', 'pacemaker cells', 'hormones', 'oxytocin', 'prostaglandins', 'adenomyosis', 'endometriosis', 'leiomyoma', 'hydro salpinx', 'treatment', 'transvaginal ultrasound', 'intrauterine pressure measurement', 'hysterosalpingo scintigraphy' and 'magnetic resonance imaging'. In addition, we eliminated articles not written in English. This strategy yielded 724 hits on PubMed and 26 additional references, mainly acquired by cross-referencing. Of the 745 articles remaining after the duplicates were removed, 561 articles were assumed relevant based on their title and their abstracts were screened, retaining 331 articles for full-article assessment. Ultimately 152 articles were included in this review, of which 27 were also included in the meta-analysis (**Figure 1**).

We looked at nine different groups of therapies which might have an increasing or decreasing influence on UP and improve pregnancy chances. To create a clear overview of the effect of the different therapies on pregnancy rates, we performed a meta-analysis of the data available. To see whether the therapies have a significant effect

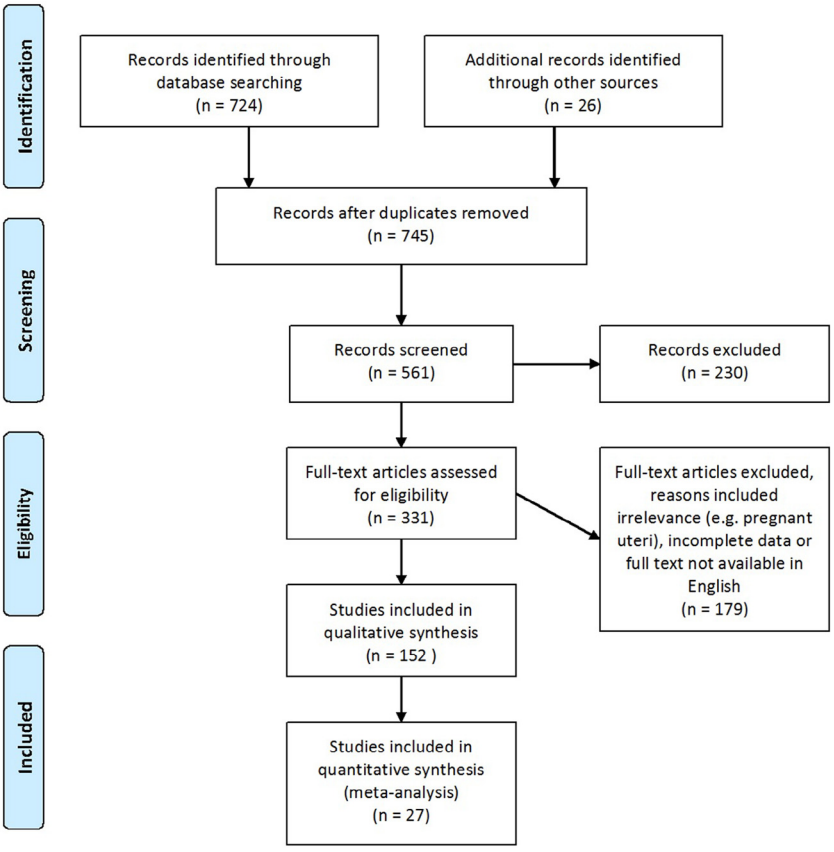


Figure 1 – Flow diagram for the selection of papers included in the meta-analysis.

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