

# Nano-dangerously big: New findings on the pseudoallergy phenomenon CARPA

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Keywords such as nano-, personalized-, or targeted medicine sound like bright future. What most people do not know, is that nanomedicines can cause severe undesired effects for actually being too big! Those modern medicines easily achieve the size of viruses which the body potentially recognizes as foreign starting to defend itself against —a sometimes severe immune response unfolds.

## A life threatening reaction

The CARPA-phenomenon (Complement Activation-Related PseudoAllergy) is a frequent hypersensitivity response to nanomedicine application. Up to 100 patients worldwide suffer from severe reactions, such as cardiac distress, difficulty of breathing, chest and back pain or fainting each day when their blood gets exposed to certain nanoparticles during medical treatment. Every 10 days one patient even dies due to an uncontrollable anaphylactoid reaction.

Apart from being activated in a different way, this pseudoallergy has the same symptoms as a common allergy, bearing a crucial difference: the reaction is taking place without previous sensitizing exposure to a substance, making it hard to predict, whether a person will react to a specific nanodrug or be safe. Intrigued by this vital challenge, János Szebeni from Semmelweis University, Budapest, has been working with scientific verve on the decipherment and prevention of the CARPA phenomenon for more than 20 years. With his invaluable support De

Gruyter's *European Journal of Nanomedicine* (EJNM) lately dedicated an elaborate compilation of the most recent scientific advances on CARPA, presented by renowned experts on the subject.

## Of pigs and men

Interestingly it's pigs that turned out to serve as best model for research on the complex pathomechanism, diagnosis and potential treatment of CARPA. "Pigs' sensitivity equals that of humans responding most vehemently to reactogenic nanomedicines", Szebeni states. In a contribution to EJNM's compilation on CARPA, Rudolf Urbanics and colleagues show that reactions to specific nanodrugs are even quantitatively reproducible in pigs (DOI: [10.1515/ejnm-2015-0011](https://doi.org/10.1515/ejnm-2015-0011)). Szebeni: "This is absolutely rare in allergy-research. In these animals the endpoint of the overreaction is reflected in a rise of pulmonary arterial pressure, being as accurate as a Swiss watch". Pigs can thus be used for drug screening and prediction of the CARPAgenic potential of nanomedicines. This becomes increasingly important with the ever growing interest in modern drugs requiring reliable preclinical safety assays during the translation process from bench to bedside. Results might also help to personalize nanomedicine administration schedules during for example the targeted treatment of cancer. The same holds true for a very recently developed in vitro immunoassay. By simply using a patient's blood sample, it tests for potential CARPA reactions even before application of specific nanodrugs.

**More information:** Rudolf Urbanics et al. Lessons learned from the porcine CARPA model: constant and variable responses to different nanomedicines and administration protocols, *European Journal of Nanomedicine* (2015). [DOI: 10.1515/ejnm-2015-0011](https://doi.org/10.1515/ejnm-2015-0011)

Provided by De Gruyter

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